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FUTURE SCIENCE FICTION

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FUTURE SCIENCE FICTION

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● FEATURE SPACE-AGE NOVELET

CRASH PROGRAM ..... *Bill Wesley* 6

The Martian ferns did not seem to be extraordinary — outside of the fact that they grew on Mars. Then people began to complain of strange effects — movies flickering, headaches, drunkeness without alcohol. But that was only the first phase of the reaction...

● SPECIAL FEATURE

THE RACE INTO SPACE ..... *Thomas N. Scortia* 66

"Operation Bootstrap", first in this series of definitive articles, investigates what it is that is keeping us behind at the present time — the fuel problem...

● SHORT STORIES

GIFT FROM THE STARS ..... *Kate Wilhelm* 46

They offered Talbot the truth — what would he do with it?

THE NEW SCIENCE OF ASTRONOMY..... *Donald Franson* 82

If you hear of the armed forces suddenly getting intensive training in the use of harvesting machines, here's the reason why.

VECTOR ..... *Margaret St. Clair* 101

It wasn't only the brutal extermination program of the Burnadors — it was the basis on which they selected the victims!

● DEPARTMENTS

THE RECKONING (Your Report on the August Issue) 81

THE EDITOR'S PAGE ..... *Robert A. W. Lowndes* 89

Continuing the survey of "Yesterday's World of Tomorrow: 1928."

SCIENCE FICTION ALMANAC 111

DOWN TO EARTH (Your letters and Our comment) 114

READERS' PREFERENCE COUPON (double-barreled) 129/130

Editor: ROBERT A. W. LOWNDES DOROTHY B. SEADOR, Asso. Ed.

COVER BY EMSH symbolizing a close finish in the "Race Into Space"

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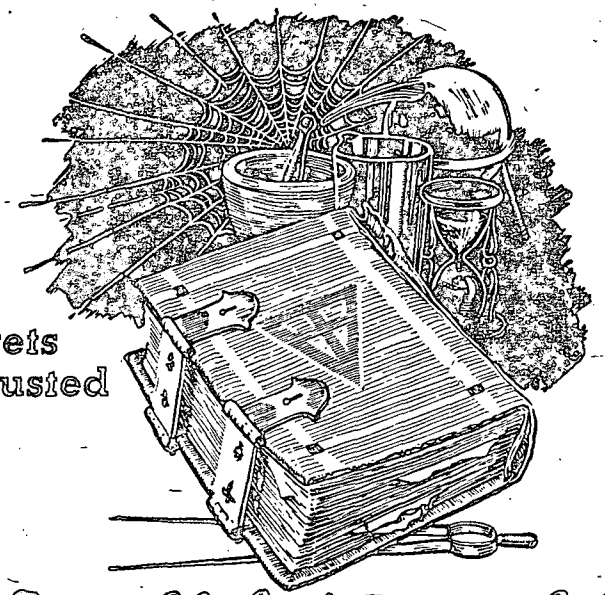

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Novelet

crash program

illustrated by FINLAY

by Bill Wesley

Suddenly, Ellen Harlow complained that movies flickered; and Hans Stauffer screamed in agony when a needle pricked him—it felt, he said, like a thousand separate stabs. Then John Harlow remembered that others who had been investigating this Martian fern had suffered from the same complaints...

DR. JOHN HARLOW had just made a startling discovery when his wife, Ellen, returned from the movie. That was why his greeting was not as enthusiastic as it might have been. He said simply, "Oh,...home already?"

Ellen smiled and came over to the table where Harlow was examining a sample of fern under a low-power microscope. She had only been married to the botanist for a few months, but she had learned not to be offended by his apparent brusqueness. When he was busy on a project it became his entire life, and she might as well be a wooden Indian.

It had bothered her at first,

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What was the connection between the Martian ferns and the strange ecstasy and madness?

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until the day she had come into his lab wearing a bikini. He had grabbed his microscope and pulled her over to the corner where there was a full-length mirror. Then, holding the microscope alongside her, he had made her look into the mirror. "Seriously now," he had said, "can you possibly be jealous of a thing shaped like that?" From then on she had not worried about him.

"The movie kept flickering and gave me a headache," she explained now.

Harlow continued pushing the fern around under the microscope and didn't reply. Ellen could see from the set of his jaw that he was on to something. She had suspected it earlier when he had sent her off to the theater alone.

"Look at that," he said suddenly, stepping back from the microscope and nudging his wife toward it. "What does that look like to you?"

ELLEN looked and caught her breath. She was no botanist, though she had been assisting her husband in studying the adaptability of the Martian ferns for several weeks. Now she saw at a glance that one of them was about to germinate.

"Well, it's about time. I was beginning to think they were all going to die here. How'd you do it?"

"I told those Brass Hats to have a little patience," Harlow said triumphantly. "You see, as soon as I got the atmospheric chamber I requested—zoom! All they needed was the right environment."

Ellen beamed at him happily. "Is this sample from Box C?"

Harlow bent over the microscope again, examining the fern for the twentieth time. "Those are sporocytes as sure as I'm alive," he muttered. "Now the question is, will they take root? We need an acre of the stuff to do this job right. If the other boxes... What did you say? Oh, yes, this is from Box C."

Ellen glanced at him strangely. She wasn't accustomed to seeing him so excited. True, it was an important event, but...

"You say you had a headache? Want me to mix you a sedative? Or a brandy? How

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about a brandy? I could sure use one."

HE STARTED toward the kitchen, changed his mind, and came back to the microscope.

"John, for goodness sake, calm down," she said, laughing at his restlessness, but feeling a little uneasy too. "You act as if you had just discovered radium or something."

Harlow glared at her for a moment, then relaxed sheepishly. "Guess I am overdoing it, huh? 'Course it's too early to get excited, but we've finally got something tangible to work with. Now if we can get a little more time..."

Ellen went to the kitchen herself for the brandy. Then she reminded her husband that they couldn't have more time. "This is a crash program, remember? You should know that as well as anyone. Hasn't Col. Voigt been hounding you every day for your report?"

Harlow winced and started pacing the floor, but she made him sit down.

"He'll *have* to give us more time—that's all there is to it," he exploded. "I'm sick of crash programs. That's what's the matter with us today—too many crash programs. Everybody's on a crash program, and nobody's exploring the by-products. Science used to move along at a reasonable rate, and there was plenty of time to evaluate an advance before the next step was taken. Now we go by leaps and bounds, and nobody's examining the areas underneath. We could upset the whole balance of nature before we even knew it."

His wife said simply, "Yes, dear. Tomorrow you can ask Col. Voigt for more time."

THE NEXT day, when Harlow called his project chief at the Pentagon Building, he thought for a moment that lightning had hit the telephone line. Col. Voigt raved about expenditures and priorities and deadlines until Harlow was tempted to hang up on him.

"That was supposed to be a simple little bug hunt," the space officer shouted. "All you had to do was sprinkle water on a few plants and see if they lived or died. What's so big about that? I expected your report a month ago."

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Harlow made an effort to keep calm. He had awakened with a headache himself that morning, and Ellen's had been worse, so he had made her stay in bed. He was in no mood to struggle with red tape—nor with red-faced project officers.

"How could I give you a report when I've just managed to keep the blamed things alive? Now I have to nurse these spores along and see if I can make them reproduce. They might just dry up and blow away."

"I wish they would," Voigt growled. "What else can they do? They'll either dry up and blow away, or they'll produce more ferns. Isn't that the size of it?"

Harlow remained silent. That was only the first phase of his project, keeping the ferns alive. His main assignment was to find out if they were of any use to mankind, and if they were harmful—and for that he needed more time.

COL. VOIGT finally gave in and said, "All right, how much more time do you need? There's a full-scale mission to Mars in three months, and the space force wants to know all they can about that plant life before blast-off."

"Then that's it. I'll need three months."

Harlow hung up and turned to find his colleague, Dr. Hans Stauffer, standing behind him.

Stauffer was a heavy-set, normally cheerful botanist who had been more than willing to move in with the Harlows—not only to complete his cataloging of the Martian ferns, but to get away from the hectic life in a government research center. The fact that Ellen Harlow was a good cook was not completely irrelevant to his decision.

Harlow told him of his discovery of the spore sacs, then of his conversation with Voigt.

"Now let's get out to the lab. I want to examine every box thoroughly. See if there's a general improvement. If not, we'll concentrate on Box C. We'll gather more samples and see if we can plot a germination rate. Maybe we can find out..."

His voice trailed off and he began pacing the room nervously. "Damn it, I don't feel good today either, and there

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are a thousand things to do. You were on the original flight to Mars, Hans. Are you sure there were no other forms of life? No flowering plants at all?"

Before Stauffer could answer, Harlow was peering into the bedroom to ask his wife if she felt better. Ellen babbled something that he didn't understand, so he assumed that she was still asleep. He left a note telling her that he would be in the lab, then half-dragged Stauffer out the door.

THE LABORATORY was a small building on the back of Harlow's lot. At one time, it had contained just about all the scientific apparatus a sporogenesis specialist could wish for; but when the environmental chamber had been installed for use on the Martian project, most of the other equipment had been moved out. Now John Harlow was almost sorry that he had insisted on working on his own property in Connecticut, instead of taking over one of the government labs.

He had hoped to be able to continue his independent research at the same time, but that had proven to be wishful thinking. The Martian project had taken up all of his regular time and most of his spare time. At first there had been two technicians assigned to the project; but one afternoon, when Harlow found them drunk, he had fired them—though they both swore they hadn't touched a drop. From then on he and Stauffer had handled the project alone, with occasional typing assistance from Ellen. Maybe this latest development would be the beginning of the end, he thought hopefully...

"Had a strange experience last night," Stauffer said, breaking into Harlow's thoughts. "Reminded me of something that happened on the spaceship coming back from Mars. We were watching a movie one night, and Dr. Peterson, the Swedish biologist—I think you knew him—complained that the picture was flickering. He wanted the operator to stop the film and see what was wrong with the projector. Well, no one else noticed anything, so we outvoted him and went on watch-

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ing the movie. He finally left the room—said he was getting a headache. Well, guess what? I went to a movie last night and, by golly, it seemed to me that the picture was flickering, though no one else noticed it. What do you make of that, John?"

HARLOW said, "Huh? Oh, yeah, Ellen mentioned that last night. You must have gone to the same theater. Probably need a new projector."

Stauffer stopped in mid-stride and stared at his fellow-botanist seriously. "You mean Ellen said the picture flickered for her too?"

"Yes, what of it?". Harlow scowled. "Good Lord, man, we've got more important things to worry about than a jerky motion picture projector."

"But don't you see? *Nobody else* noticed it. Only Peterson on the spaceship, and Ellen and I last night."

"You've probably got sensitive eyes. Come on, Hans!"

"Then why didn't I notice it when Peterson did? No, John, I think something's happened to our eyes. Peterson worked with that plant life constantly, and so have Ellen and I lately. I think it may have some adverse physiological effect—contain a drug of some kind maybe."

"How about me? I've been working with it as much as anyone, haven't I?"

Stauffer started to say, "Yes, and you're acting peculiar yourself," but he held his tongue.

II

THE MARTIAN ferns had been set in three different soil boxes, each in a separate compartment of the environmental chamber. Box A had been maintained at Martian atmospheric conditions. Box B had been exposed to the natural climate of a Connecticut spring, and Box C had been subjected to a simulated tropical climate.

The ferns in Box A had shown some life, but not much. This was right in line with what the expedition had reported from Mars. By Earth standards, the ferns were a sturdy breed. On Mars they

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put up a desperate struggle to live.

The ferns in the other two boxes had shown a little more willingness to develop, but not until the night before had there been any significant progress. Then the sample from Box C suddenly produced some spore sacs and the project took on new life for John Harlow. Now, as he opened the lab door, his eagerness got the better of him and he ran to the environmental chamber to peer inside.

At first he was disappointed. All the ferns appeared to be dead. Their fronds had turned brown and were drooping sadly. Then he looked again and changed his mind; they were not dying, and they hadn't turned brown. They were drooping because of the tremendous sporangia, or spore sacs, hanging from the underside of each frond. The clusters of brown spores, each one seemingly on the point of discharging into the air at the slightest disturbance, gave the ferns their brown color.

"Hans, we're in!" he shouted, whacking his associate on the back. "They're going to pop any minute now—even those in Box B. Set up a magnifier and we'll watch them through the wall of the chamber. How do you like that! We'll witness the entire reproduction process."

STAUFFER jumped to get a magnifier. He had learned to act first and argue later when working with Harlow. But he protested as he jumped.

"Releasing spores isn't reproduction. They might not take root—and even if they do, I feel the same as Voigt does about it. So what? We'll just get more ferns."

Harlow growled at him and jerked the magnifier out of his grasp. "Maybe so, but we won't know till we see it. This is the time for observation, not speculation. Get some more soil boxes ready—I'm going to jiggle one of these fronds and see what happens."

FOR THE next six hours, they worked rapidly, transplanting ferns into newly-prepared soil boxes, giving each plant as much living space as possible. Then they took everything out of the environmental chamber, opened its doors,

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turned up the controls, and converted the entire laboratory into a hothouse. By mid-afternoon they had a semi-tropical jungle of ferns growing around them. Their hands were covered with sticky brown stains from the sporangia, they were h u n g r y, but, surprisingly, neither of them complained of being tired.

"I feel pretty good," Harlow said as he locked the lab door. "I think I'll come back after a while and play around some more. How about you, Hans?"

Stauffer didn't answer. He was staring into some bushes at the edge of the garden where a cat was playing with a grasshopper. Although it was still bright daylight, the cat was almost in darkness, due to the thickness of the foliage. What had aroused Stauffer's curiosity was the fact that he had just glanced at the sun, yet he could see into the shadows clearly. He tried it again. This time forcing himself to stare at the sun for several seconds. Then he looked into the shadows. He could see everything easily—with no eyestrain.

"It—it looks like a—like we might have a storm," he said hesitantly. "We'd better get back to the house."

He walked on ahead, not wanting to face anyone just then. Something had happened to his eyes, and he didn't know what. He didn't know if it was good or bad, but he suspected that in someway the Martian ferns were responsible...

HARLOW made two complete tours of his house looking for his wife, then he spotted the note on the telephone stand. *Gone to the drug store for a pill. See you at dinner. Ellen.*

He fixed himself a fried egg sandwich, then tried to take a nap. He was too excited over the new developments in his project, however, so he went back to the lab. He was surprised to find Stauffer already there.

"Couldn't rest either, eh?" he chided him.

Stauffer didn't reply. He was setting up a blink-microscope and staring into it with a worried expression on his face. Finally he called Harlow over to have a look.

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"I don't see anything. Your slide must have slipped. Anyway, you've got the frequency set too low. A blink-microscope isn't supposed to blink, you idiot."

"So it isn't," Stauffer agreed. "At least not at two hundred cycles a second."

"What! You're crazy!" John Harlow checked the oscillator feeding the microscope. It was set for two hundred cycles, yet he could definitely see the neon light blink. He couldn't believe it.

"I didn't tell you this," Stauffer said, "but out there in the garden a while ago my eye retained no blindness effect after being exposed to the sun directly for several seconds. John, we've lost our persistency of vision."

HARLOW gazed at him in surprise for a long moment, then began pacing the floor. He stopped suddenly when he realized that it was a habit he had acquired only in the past day or two. Little by little, the significance of what was happening to them crept into his brain.

"First Peterson on the spaceship," he said slowly. "He could see the projector flutter at forty-eight cycles per second. Then you and Ellen last night..."

He shot Stauffer a worried look and grabbed for the telephone. He flipped a switch marked "Inter-com" and dialed a number to clear the line. The telephone in the main house rang, but no one answered.

"Well, she's probably all right. She went to the drug store for a sedative."

Again he started pacing the floor. "Why was it Peterson who came up with the symptoms first? Didn't all of you handle the ferns?"

Stauffer said, "Not exactly. We all helped gather it, but Peterson studied it all the way home. He kept hoping he'd find some microscopic animal life."

"Well, find out what happened to him—he's the key to what we're getting into. Have you heard from him since you returned to Earth?"

"No, I've been too busy to contact him. We were all quarantined, and I'm positive that Peterson was still in the hospital when I left."

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"Well, put in a call to Washington and find out where he is now—and—and how he is."

STAUFFER picked up the telephone and called the telegraph office. While he was sending his message, Harlow prepared a stiff tranquilizer solution and gave himself an injection.

"Now sit down, Hans, and let's recapitulate."

He took a sheet of paper and drew a vertical line down through the middle of it. At the top of the left hand section he wrote, *"Loss of vision persisteency"*. On the same line, but in the right hand column, he wrote, *"Los of vision persistency"*. On the same line, but in the right hand column, he wrote, *"Stimulation of cells in retina of eye"*. He thought a while, then added, *"or in brain"*.

Stauffer was watching closely and said, "Stimulation? I'd say deterioration."

"No, Hans. Think a moment. What causes persistency of vision in the first place? The inability of the cells in the retina of the eye—or in the brain—to recover instantaneously from an impulse of light. A powerful stimulant might increase the elasticity of the cells to the point where there was virtually no hysteresis at all—to use a borrowed word."

He jumped up suddenly and ran to a cabinet where he kept a bottle of brandy. He took a quick shot, then held the bottle out to Stauffer, but Stauffer shook his head.

"Now, what's next?" Harlow asked, as he came back to the table.

For the second item under symptoms he wrote, *"Headaches."*

HE LET HIS pencil hover over the paper while he considered the probable causes.

"Suppose there was a general stimulation of all body cells," he said. Then he slapped his leg with his open palm and shouted, "That's it! Those two lab technicians that I fired for being drunk—they had been working with the growth for days. That's probably a later symptom, drunkenness. We ought to find them—see what condition they're in now. And apologize, too.

"Don't you see, Hans? A

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general stimulation would increase brain activity, resulting in the headaches that Ellen and I felt. Later, when the brain cells have taken all they can stand, fatigue will set in, followed by a pseudo-drunkenness. And the nervousness—might as well admit it," he said self-consciously, as he wrote "*nervousness*" down as a symptom—"I realize now that I've been on the verge of hysteria for a couple of days. That could be due to over-stimulation too."

Stauffer was having trouble keeping up with the fast-talking Harlow. "How do you come to that conclusion?"

"Elementary, Hans, as the d master used to say. A imulant supplies energy in the form of an impulse to the receptive end of a nerve. In the normal state, it takes a second or two for this impulse to reach the brain. In the state we're in now, the impulse is passed along the nerve to the brain almost instantly. The receptive end recovers immediately and is ready to pass another impulse to the brain—possibly before the original impetus is removed. From an impulse of very short duration, you might—if the nerve were elastic enough—receive a number of messages at the brain. And this unaccustomed twanging of the nerves would soon produce a nervous condition in the body. Here, I'll show you."

HE GRABBED Stauffer's hand, and before his assistant knew what was coming, had jabbed a needle into his palm.

Stauffer let out a yelp. The pain was sharp, and was over in a second; but in that second Stauffer felt what seemed like a thousand needle pricks—as though the needle had stabbed him many times rapidly, instead of only once.

Stauffer was speechless. He had never thought of the persistency of pain; now he had lost that, too. What did it mean? Without persistency of vision, the television and motion picture industries would fail. Maybe that wasn't so bad. But what else could the harmless appearing ferns from Mars do to them? He didn't know, and the uncertainty gave him a strange feeling in the pit of his stomach.

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HARLOW jumped to his feet and started pacing the floor again. He gave himself another injection of the tranquilizer solution he had mixed, forgetting that he had just had one. "Hans, there are too many questions," he said. "We need time. We need a biologist, and a chemist, and some more lab equipment, and some mice and guinea pigs. Do you realize that if all organic cells became highly elastic, there would be no such thing as a lasting impression? Memory itself would fail. We might forget how to perform the most basic human functions. It's stupendous! And we don't even know how the contamination is passed. Is it something on the surface of the fronds that scrapes off onto our skin? Is it a vapor exuded from the sporangia?.... Good heavens, Man! The spores!" he thundered. "If they should scatter they could cover the whole county in a matter of days."

They both stared out the laboratory window as if with the same thought. Even as they looked, the leaves on the nearby trees and bushes began to dance in the wind.

"You were right," Harlow shouted. "We are going to have a storm. We've got to check this building for leaks. Don't open the door, or any of the windows. We've got to keep these spores trapped. I'll call Col. Voigt, then we'd better install a fan over the door so we can use it without letting spores escape."

STAUFFER had ceased paying attention. He was looking at the brown stains on his hands, and twitching foolishly, as if afflicted with a case of St. Vitus Dance.

"What's the matter with you?" Harlow shouted, pausing in his step toward the telephone.

Stauffer staggered a few feet toward one of the soil boxes and grabbed a handful of fronds, scattering spore sacs all over his clothes and onto the floor. Harlow grabbed him by the shoulders and shook him, but instead of shouting at him, he had to laugh. Hans Stauffer, who had never taken a drink in his life, was now drunk.

"Sit down, you ass, and let me give you a shot," Harlow said.

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Stauffer tried to push him away, then held up a handful of fronds to Harlow's face and said, "Pretty little things, aren't they? Yknow, I'vnevrrrr really looked at 'em before. Havvvvyou?"

He tickled Harlow's nose with the ferns, then tickled his own. Both of them laughed.

"Oh, you're crazy," Harlow said, but he didn't really mind. It was pleasant to relax...

Stauffer rose to his feet unsteadily and said, "I'm gonnaget you somfrrrns to playth."

He moved toward one of the soil boxes and fell across it clumsily. His hand struck sharp edge of the box and eamed in pain. Harlow help him up, but had with his own sense of ance.

"Now you've got me oinnnt," he laughed. "Here, I'llll get youfrrrrn."

"I want onefthse."

"You canve mine," Harlow said, but when he extended his hand he no longer had the fern. "Oh, sgone," he said sadly.

THE PHONE rang and John Harlow fumbled for it. It was a reply to the telegram that Stauffer had sent to Washington.

"Dr. Peterson confined to mental hospital. Diagnosis: space fatigue. Early symptoms: loss of persistency of vision, self-induced intoxication. Later symptoms: loss of speech coherency and sense of balance. Present condition: no physical coordination, no mental processes."

Harlow cocked his head to the side and tried to listen carefully, but it was no use. He couldn't make out what was being said. Somebody couldn't talk—or was too drunk to talk. He wasn't sure. Anyway, somebody was still in the hospital; he understood that much. "Well, thassspity. Thanksmuch."

"Will there be any further message?"

"No. No messsage. Thanksssmuch. Gbbbb..." He hung up.

Stauffer handed him a shot of brandy and he held it for a long time, looking down into it. Finally he let it slip from his fingers and fall to the floor.

Stauffer was still holding the bottle, but then he let it fall

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too. "We were go look forrrr technens," he said. "You think-weeeshoooo?"

"What technens? Oh, those I fiiiirrrrd? No, they'll com-aftthrrrr pay." Harlow swayed about the room happily, turning over bottles and emptying soil boxes onto the floor. "H a n.s s s s, dyou know ansongggs? How about *'MWild IrshRssss'*? No, you'reGermnnnn. You woun't liktht. Howbt..."

THE PHONE rang again.

"What wastht?"

"I don't knnnn. Thlst time tht happnd you talkd ththg."

"Wellll, you talkths time."

"What'llllsaaaa?"

"I don't knnnn. What'dlsaaaa?"

Stauffer stumbled toward the phone, dropped it, and picked it up again. "Hlooooow," he said.

Col Voigt said, "Let me talk to Harlow."

"Whoooo? Whoooodsaaaa?"

Harlow turned over more bottles and emptied more soil boxes. He threw one of them across the room and it broke a window. He screamed in pain as a sliver penetrated his skin. Then he threw a soil box at one of the other windows, laughing gleefully as the glass shattered.

"Harlow!" Col. Voigt shouted. "Let me talk to Harlow. What the hell's going on up there? Are you drunk?"

"Oh, I can'tundstnd you," Stauffer said. He let the telephone fall from his fingers and joined Harlow in emptying soil boxes and breaking bottles. He tripped over the telephone cord and fell. Harlow laughed and pushed a bookcase over on top of him. Stauffer screamed and H a r l o w began to sing, "MWiiiildlrrrrshRssss, T h-*Sweeeetst Flrrrr...*"

Outside, the wind pick[ed] velocity and created a sw[irl] side the laboratory. Bi[llions] ferns and spores began dancin[g] in the air. Some of them flew t h r o u g h the broken windows...

III

SIX DAYS later, John Harlow opened his eyes and stared at the white walls of a hospital room. An attendant beside his bed arose immediately and pressed a

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wall button. Then he leaned over and said, "How you feelin'? Can you understand me all right?"

Harlow squirmed uncomfortably, not caring much for having anyone standing over his bed, and said, "I feel fine. Of course I can understand you. Why shouldn't I? You're speaking English, aren't you?"

The attendant shrugged and sat down again.

"Where the devil am I?" Harlow asked. "In a hospital? What happened? I pass out or something?"

"Your doctor'll be here in a [redacted]inute," the attendant said. [redacted]ll answer your questions."

Harlow struggled to a sitting position and flexed his arms a few times. He was about to ask more questions when the door opened and a doctor and a nurse came into the room. The doctor came over to the bed and raised Harlow's eyelids one at a time, then started to take his pulse. Harlow opened his mouth to speak, but the doctor held up a restraining hand.

After a quarter of a minute he said, "Well, I guess you're back in the fold now. My name is Larkin. I'm a neurologist. You seem to be suffering from a nervous condition which, I am embarrassed to say, we have found quite baffling. Now that you're conscious, maybe you can help us. What do you remember of the last few minutes, or the last few hours, before you passed out?"

HARLOW glared at the doctor, then suddenly threw the bedclothes aside and jumped to his feet. "I remember everything, of course," he shouted. "Why shouldn't I? You think I'm some kind of mental case? Call Col. Voigt at the Pentagon Building. I've got to talk to him at once."

"I've already put in a call for Col. Voigt," Larkin said. "He'll be here in about twenty minutes. I suggest you lie back on the bed and wait for him."

"Twenty minutes! How's he going to do that? Is he up here in Connecticut?"

Larkin smiled patronizingly. "No, he isn't up here in Connecticut. You're down here in Washington."

"Washington? How'd I... Say, how long have I been here? I mean, how long ago did I pass out?"

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Larkin told him, and John Harlow sank back onto the bed in bewilderment. Six days! Anything could have happened to the ferns in six days. They could be growing somewhere on the outside, right now. There was no time to waste. He'd have to get back to the lab and replace the broken windows. Then get a small army and scour the countryside, destroying everything that even resembled a fern. What if it was too late? Thousands of people already contaminated—losing their minds—like Peterson. And how about him? Why had he been spared—if he was spared?

"How's my wife?" he asked excitedly. "Did Ellen get a touch of this too? And Dr. Stauffer—is he all right?"

"Your wife is fine," Larkin said. "She's in a room down the hall. But Dr. Stauffer is in a very serious condition. Temporarily, at least, he's out of his mind. That's why we hoped..."

AGAIN HARLOW jumped to his feet. "Give me my clothes," he demanded. "This is serious—deadly serious—and I've got things to do."

Larkin and the attendant both sprang forward to force him back into bed, but Harlow shrugged them off easily, dodging their out-stretched hands like an elusive halfback.

"Let me have my clothes, I said. And sign me out of here. There's no time to waste."

He stood in the middle of the room and glared at the two men and the nurse defiantly. He didn't understand his new feeling of competence, but it was wonderful. He felt healthy, all over. Super-healthy, as if he had been dreaming all the time and had only now come to life.

Then the effect was still with him—but in an arrested state, he assumed. The drunkenness had only been a phase, from which he had recovered—though Stauffer had not. The tranquilizers! That was it. He remembered the injections now—stiff ones, both of them—mostly morphine. Apparently they had been strong enough to protect his brain, but not strong enough to neutralize the effect entirely. Then what condition was he in at the moment? He felt—how *did* he feel?

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He felt sensitive. That was the word for it. Sensitive and quick. His reflexes were sharpened too; he sensed it. Of course they would be. Reflexive action was simply nerve response in reverse—the reflection from the brain of an afferent impulse sent to the brain...

He watched the attendant moving toward him and had an almost overwhelming urge to try a left jab. He was confident that he could hit the attendant a dozen times before the man could duck once. But he'd have to watch out for sharp objects, and not bump his head, or bang a kneecap. He remembered the experiment he had worked on Stauffer with the needle. Good thing he didn't have a toothache, or rheumatism...

THE DOOR opened again, and Col. Voigt and another man came in.

"Harlow! What the hell happened?" Voigt bawled at him form the doorway.

"Plenty," Harlow said. "I'll explain it while I'm dressing. Tell these people to bring me my clothes, will you? I've got to get back to my lab."

The colonel looked at Larkin, but Larkin only shrugged. Then Voigt turned to Harlow and said, "Slow down a minute. There's no hurry for you to get back to your lab. We moved everything down here to one of the government research centers. Your place is pretty much of a wreck. As a matter of fact, you're no longer on the project."

Harlow spun on him. "What do you mean, I'm no longer on the project? Who else knows anything about it? It isn't my fault that Stauffer got an overdose of whatever it is that's in those ferns. If you hadn't pushed us so hard..."

"Wait a minute," Voigt broke in. "You mean to tell me that this—this—whatever it is you got, was brought on by those skimpy little ferns?"

"No doubt about it. Those skimpy little ferns probably contain the most powerful nerve tonic Man has ever known. Apparently, the effect can be fatal—but doesn't have to be. Witness me, standing here arguing with a roomful of boneheads. I'll tell you the whole story if somebody will give me my clothes. Otherwise,

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I'm running out of here just as I am."

Dr. Larkin threw up his hands in resignation. "Let him have his clothes," he told the attendant. Then he said to John Harlow, "I think you need more rest, but go if you want to."

Harlow said, "Good. Glad that's settled."

THE MAN who had come in with Voigt was an FBI agent, Hal Rafferty. He had been called in because of the security classification of the project. Harlow told the two of them as much as he could remember of what had happened at the lab, concluding with his own idea of a plan of action.

"First we want to isolate all the ferns that we know of. Then we'll have to look all over Connecticut for signs of new growth—places where the spores could have taken root. Third, we'll look for indications of contamination among animals and people."

"How about treatment?" the G-man asked. "Will you know what to do if we find contamination?"

Harlow shook his head slowly. "We'll have to experiment. I used morphine, but maybe a milder drug will do just as well. I have a feeling that timing may be important. Catch the effect before it goes too far..."

He started to add, "Maybe just far enough to improve nerve response," but he decided to hold that information back for a while. He wasn't sure yet if super-nerves were a good thing or a bad; and until he found out, he decided not to let anyone know that he wasn't normal.

WHEN HE was dressed at last, he asked Voigt and Rafferty to wait for him while he stepped into his wife's room. He was eager to run some tests on her, too, but didn't want to take the time right then. He could only hope that she was all right.

He tried to be light-hearted as he walked toward her bed, grinning, and saying, "Hi!" Then he kissed her.

Her lips were soft and sweet, and she returned his kiss warmly. But her lips had always been soft and sweet; now

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they were so much more. They were luxuriously alive, caressing his mouth with a thousand delicate flames, sending wave after wave of ecstatic sensations coursing through him. Never had a kiss been so tender, and yet, at the same time, so full of passion.

He stared at her incredulously as he moved back a few inches. She smiled, and wrinkled her nose at him, and he knew that it had been only a kiss to her. It was his own lips—his own heightened senses that had transformed the simple kiss into an exciting experience. His wife was a normal—he was a super.

In a way, he was glad; there might yet be complications that he didn't know of. At least she was safe. But he was disappointed, too; imagine, if he could have thrilled her the way she had thrilled him! If only a kiss could... He forced himself to think of something else.

"I'll see you soon, dear," he said hurriedly. "There are a thousand things to do now. Be good."

HE FELT cruel, leaving her so abruptly, but he had a tremendous compulsion to get out into the world and see what challenges it had to offer a man with super-sensitive nerves and reflexes. The ferns held no terrors for him now; in fact, they were beginning to seem too trivial to bother with. He could cope with any problem now. Big stuff. The entire Martian project perhaps—and not as a lowly botanist. No, sir! He was going to get over to the Pentagon and tell those Brass Hats what was wrong with the way they had organized the whole thing. They'd beg him to take over when they had heard a few of his ideas. Let somebody else play with the ferns for a while; he had bigger fish to catch.

He came out of his wife's room and saw Col. Voigt and Rafferty waiting for him. He walked right past them. Voigt called to him, and Harlow ignored him. The G-man stepped forward quickly. John Harlow turned and walked around him. Rafferty and Voigt both reached for him, but Harlow slipped through their fingers easily. He laughed at Voigt's wide open mouth as he ran past him and down the hall

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to the stairway. He took the steps three at a time. In a matter of seconds he was on the sidewalk. He sprinted easily for two blocks, dodging curious pedestrians as if they were trees in a park.

When finally he slowed to a walk, he wasn't even breathing deeply. Instead of being exhausted, he felt exhilerated. The flow of oxygen into his lungs was like a taste of champagne. He could actually feel it. And he could feel the blood flowing through his system, making him seem alive all over. His senses had sharpened unbelievably. He could hear, and see, and smell with a sensitivity that he had never imagined. He was impatient to try his taste buds. Sink his teeth into a medium-rare New York Cut. Or feel a sip of dry burgundy trickle down his throat. Or try a rich dessert. Would he be able to stand it? Could a man's senses be too sharp for his own sanity? There was only one way to find out. He began searching for a restaurant.

"I'm alive," he said over and over to himself. "I'm the first man who's ever really been alive."

IV

FOR FOUR days, John Harlow roamed the streets of Washington D. C., looking, listening, smelling, tasting, and feeling. There were almost as many disappointments as there were thrills, but it was all new and exciting. He tried to listen to a symphony orchestra, but the musicians could not satisfy his sensitive ears. He heard little squeaks and scratches and slurs, instead of the pure tones that held the rest of the audience spellbound.

He went to a baseball game, but found the crowd noises and the smells unbearable. The fragrance of powder and perfume at the concert hall had been pleasant enough, though it had all been mixed into a heterogeneous scent without character—but the odor of beer and cigar smoke and perspiration at the ball park nauseated him. There wouldn't be many baseball fans among supers, he suspected.

Twice in the four days he was almost picked up by FBI agents, but managed to elude

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them both times. The first instance he caught on to the tailgate of a fastmoving furniture van and swung himself aboard as easily as if he had been playing on parallel bars in a gymnasium; the second time he simply walked across the street. Automobiles came at him from both directions, and pedestrians screamed, expecting to see him smashed to pulp. But he found that he could judge fast-moving objects almost as accurately as slow-moving ones. Nothing touched him.

THEN, ON the fourth day, as he was crossing a busy intersection, an automobile fender brushed against him, almost knocking him down; a second or two later he felt a dull pounding in his leg. For the first time in four days, his body had not recovered instantly and completely from an injury. Even more important, he had seen the car and had tried to dodge it—but had not been quick enough. Slowly, the truth worked its way into his consciousness: the effect was beginning to wear off. He was about to become a normal again.

He had suspected all along that the condition would not be permanent, but it was disappointing now to feel the change taking place.

So that was that, he thought sadly; the party was over. He'd have to go back now and take his punishment. Well, he had lived up to the great tradition of science, he mused. He had been his own guinea pig—even if not intentionally. That afternoon he reported to Col. Voigt at the Pentagon Building.

He spent two hours trying to convince Voigt and Rafferty that he was not a criminal, and that he could still be useful on the Martian project.

Finally the colonel said, "All right, I have to take your word for it, whether I like it or not, because this thing is getting out of hand. Let me tell you where we stand. We tried to put that program of yours into effect, but it isn't running so smoothly. We isolated all the ferns that we could find, and we think we've prevented further spread. So far so good. Then you said that we should look all over Connecticut for

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signs of new growth. Right?"

HARLOW nodded. He was beginning to fear the worst.

"Well, Connecticut was only the starting point," Voigt said bitterly. "Already we have found those damn ferns in Labrador, Cuba, Texas, and a dozen points in between. There are twenty cases of contamination that we know of—and that means there are probably two hundred that we don't know of. We have those twenty cases under observation; and they've all been given sedatives of one strength or another; but instead of curing them, the drugs seem to pep them up. They all think they're some kind of supermen. They want to run the whole damned planet, and I'm not so sure that they couldn't. They've shown unbelievable powers..."

Harlow gestured for him to stop. "I know," he said wearily. "I've been there. We've got to develop a more positive cure. Meanwhile, you'll have to keep those people confined, and grab anybody else who develops the symptoms. If we can catch a few in the earliest stages we might be able to work something out."

Voigt agreed reluctantly to reinstate him on the project, and John Harlow took over a small lab in one of the government research buildings. Rafferty stationed one of his G-men in the outer office.

THAT NIGHT at Madison Square Garden, a five-to-one underdog put on an amazing display of boxing and knocked out the lightweight champion of the world in the first round.

The next day, a thief stole a hundred thousand dollar bracelet from a Fifth Avenue jewelry store simply by picking it up and dashing into the street with it. At least a dozen pedestrians made a grab for him, but he eluded them easily. Police officers, reluctant to fire into the crowded street, tried to chase him down; he evaded them, too, and escaped into a subway station.

An unknown jockey brought in three long shots in one day at Laurel Park, and sportswriters agreed that it was the jockey who won the races, not the platers he was riding. The *New York Daily Telegram*

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said, "...his skill at judging the pace and threading his way among horses to find almost imperceptible holes was as expert a display of riding ability as tracksiders had seen anywhere."

By the end of the week, the entire eastern seaboard was alerted against a mounting wave of burglaries, purse snatchings, and sex assaults. Jails were overflowing with drunks, most of whom developed into mental cases within twenty-four hours. Doctors reported an incredible increase in hypochondria — persons screaming with pain from tiny scratches or light muscular strains, imagining their afflictions to be much greater than they actually were. A bus driver was arrested for driving a loaded bus seventy miles an hour through a suburban area of Boston. The driver laughed at the charge—said he had full control of the vehicle at all times; then he eluded the arresting officers by running, "...wildly, and with amazing speed between a row of apartment buildings."

THERE WERE many such reports and Harlow read them with increased anxiety. He had hardly slept for a week; he had experimented with every patient whose relatives gave him the necessary permission, trying to find a nervine to counteract the effect of contamination. At the same time, Rafferty had been busy trying to track down the sources of contamination.

Neither of them had met with much success. Harlow discovered that the introduction of a strong drug immediately after contamination was effective, but it was a meaningless cure. All of his subjects had been exposed to the deadly secretion from the Martian ferns for at least six hours before he got to them; and after the first six hours there was only one course for the affliction to take —a complete breakdown of all mental processes.

The main thing that kept gnawing at his insides, however, was the suspicion that someone on the outside was working on the project, too. Someone not connected with it legally, but who knew, nevertheless, how to control the effect—and who, no doubt, was getting rich off the proc-

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ess. The evidence was too great to be attributed to coincidence.

THE NEW lightweight champion of the world did not lose his mind. Eight days after his upset victory, he held a press conference. Harlow attended it, and had to admit that the man appeared normal. Where had he been for eight days? His manager only smiled and said, "My boy needed a rest. He earned it, so I saw that he got it."

The unknown jockey at Laurel Park failed to show up for his riding assignments for a few days. When he did, he finished up the track, just as he had done consistently before his one big day.

Most of the purse snatchers who were identified, turned out to be habitual petty criminals who had never before shown any remarkable finesse in their trade. Most of the sex crimes were committed by people with no criminal records at all. Many of the women involved said they had been out with their regular boyfriends who, after a little necking, simply went wild and started mauling them and tearing at their clothes.

The drunks were different; they were the most pitiful of the lot. They were people who had come into contact with the ferns accidentally and had had no treatment at all. Harlow was able to save only a small number of them. The others followed the example set by Peterson—within twenty-four hours they were hopelessly insane.

Then one morning Harlow received a call from Rafferty to come over to the FBI building. There he was introduced to a mousy little man named Johnny Carlotta who had come into the office voluntarily with information on the "Hormone Racket", as he called it.

"Look what he brought with him," Rafferty said, handing Harlow an envelope with a tip of fern in it. "He says he paid five hundred dollars for it. It was supposed to make him more masculine or something. It didn't work, so he wants us to get his five hundred back."

HARLOW looked at the fern. It had been squeezed almost to a pulp, but it was

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unmistakably Martian. Then why didn't it work? Why wasn't the little man either a super or a blubbering idiot?

"What made you think that this fern was worth five hundred dollars?" Harlow asked him. "Isn't that a lot of money to you?"

Carlotta squirmed uncomfortably. "Course it's a lotta money. That's why I'm sq... That's why I want it back. The guy that sold it to me, he said it was worth a fortune. Said he squeezed a little of the juice outta that weed and in a few hours he was like superman. What's more, he proved it."

"How did he prove it?"

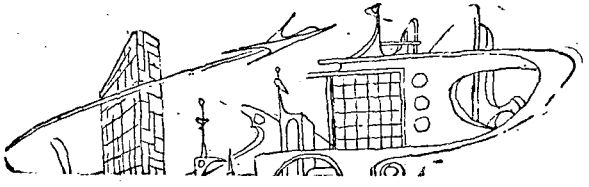
"Well, for one thing, he showed me that he could see in the dark—or almost in the dark. He read license plates more than a block away, up a dark street. Then he gave me a flower to hold in my hand and he told me which hand I had it in just by smellin'—he did that one from ten feet away."

"Anything else?" Harlow asked. He knew that he was the only one in the room who believed Carlotta's story.

"Let's see. Yeah, he ran across the street and back, right through a bunch of wild taxis—they didn't even touch him."

RAFFERTY looked disgusted. "A guy performs a couple of tricks on a street corner and you think he's a superman. Is that what you're trying to give us?"

Carlotta shuffled his feet awkwardly. "There was more to it than that," he said. "I ain't so dumb. I seen those pictures of ferns you put in the



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papers, tellin' people to send in any samples they found layin' around. And I saw a guy who became the slickest pickpocket you ever saw, overnight, just from rubbin' one of them ferns in his fingers. So I put two and two together. I ain't so dumb."

"No, you ain't so dumb," Rafferty taunted him. "Then where's your five hundred bucks?"

Carlotta flushed and remained silent.

Harlow had been studying him intently and trying to figure what had gone wrong. Suddenly he had an idea. He jumped forward and grabbed Carlotta's coat, pulling it down off his shoulders. Carlotta was wearing a sport shirt, with short sleeves. One glance was all that Harlow needed.

"There's your answer," he told Rafferty, pointing to the tiny marks on Carlotta's upper arm. "He's an habitual user of heroin. Probably had a shot right after he used the fern, or just before. The toxic agent in the fern juice was neutralized as fast as it entered his system. That's why it didn't work."

IMMEDIATELY, John Harlow had another idea. Maybe he wasn't up against a clever opponent at all. Those people who developed super nerves could have been light drug addicts. They might have scraped against a fern accidentally... No, he had to reject the idea. The number three contender for the lightweight championship of the world wouldn't have been a dope addict. Some of the others might have been. Some of the petty crooks, and some of the sex criminals—they could have been accidental cases if they had happened to have a narcotic in their blood.

Where did that leave him? Nowhere, he had to admit. If anything, he was worse off than before. Now he had to face the likelihood that only some of the supers had bought their treatments—the question was, which ones?

He turned back to Carlotta. "You want your five hundred, don't you? And you want more than that. You want the guy salted away in jail who made a fool of you. Am I right?"

Carlotta nodded hesitantly. "I guess so. I ain't never squealed before, but after all,

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when one of your own pals..."

"Sure, I understand," Harlow interrupted him. "I'll make you a proposition. You do me a favor, and I'll give you your five hundred. Mr. Rafferty here will see to it that your double-crossing friend is brought to trial, and he'll also forget to book you as a dope addict. Is it a deal?"

CARLOTTA was trapped. It had never occurred to him that the FBI would grab him on a dope charge. He hadn't intended to come to the FBI office. Things just hadn't worked out right at all. He decided that he'd better take whatever they offered him.

"What's the favor?" he asked cautiously.

Harlow thought for a moment, then asked, "Does this friend you bought the fern from know that it didn't work for you?"

"No, I ain't seen him since—and I better not see him. I'll slip a—I'll sock him one."

"I wouldn't blame you," Harlow said confidentially. "Then here's what I want you to do. I want you to pretend that it did work. I'll coach you how to act. Then I want you to contact him and tell him that I've got five hundred dollars too, and that I want some fern leaves to squeeze. Will you do it?"

The plan was too subtle for Carlotta, but if it meant getting away from the cops, he was all for it. He agreed.

V

CARLOTTA turned out to be the world's worst actor, and by nine p. m. that night Harlow decided that he wasn't likely to improve, so he called off the rehearsals. An appointment was made for eleven o'clock at a cheap hotel on the west side of Washington. John Harlow put on his shabbiest suit and crushed his hat into a fair replica of what he thought a not-so-clever pickpocket might wear; then he and Carlotta set out for their meeting.

When they arrived, they were met by Carlotta's friend, another little man—this time of French descent. His name was Paul Davarre. Carlotta's act was so corny that Harlow

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sent him out for a quart of beer at the first opportunity, then settled down to what he hoped would be an enlightening conversation with Davarre.

Davarre was a super—Harlow was almost positive of that—somewhere between the sixth and eighth days, he guessed, though it wasn't easy to tell. A small man stayed under the influence longer than a larger man; he had learned that much from his experiments. That meant that if Davarre was anything brighter than a moron, Harlow would have to watch out for him.

Davarre wasted no time coming to the point. "You got the five hundred?" he asked.

HARLOW showed it to him. Davarre drew an envelope from his wallet and started to exchange it for Harlow's stack of bills.

"Not so fast," Harlow said. "I know a little something about this stuff, and I been readin' the papers." He was tempted to say, "I ain't so dumb," but he didn't. "I know that it don't always work. Some guys have gone crazy after usin' it. How do I know it won't put me on the idiot list too?"

Davarre narrowed his eyes. "I don't know buddy. I'm only a peddler. Maybe those guys didn't have the right weed. You want the stuff or don't you?"

John Harlow had to decide what to do. Any more hesitation would arouse Davarre's suspicion. If he was a super—and Harlow was sure that he was—he would know that an injection was required to make the fern secretion effective. In that case, he would know that Carlotta had been putting on an act; but anyone would have known that, anyway. Harlow made up his mind to gamble. He reached into his billfold and took out another five hundred dollars.

"There's a bonus," he said, "just between you and me. I want you to make sure that I don't go all the way."

Davarre studied him for a full ten seconds, which was like an eternity to a super. Then he said, "Wait a minute."

He went into the hall and closed the door behind him. Harlow heard the noise of a pay phone—first the coins

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dropping, then the dialling—but when Davarre began to talk he kept his voice low, and Harlow couldn't make out anything.

After about a minute Davarre returned. He took the thousand dollars from Harlow's hand and said simply, "Follow me."

Harlow followed.

DAVARRE led the way to an all night garage where his car was parked. Harlow didn't care much for the idea of riding with a super, but it was too late to turn back. He slid into the front seat and prepared himself for a wild ride.

Davarre fooled him; he drove at a fairly respectable speed. Harlow began to wonder if Davarre might have been fooling him all along. Maybe he was not a super—just the nervous type.

He studied the little man more closely—watched the shift of his eyes, and the action of his hands on the steering wheel. No—there was no doubt about it. Davarre was a super; but a highly restrained super—and that was a new one. Harlow began to wonder if he had bitten off too much this time.

Davarre took no chances of being followed. He stayed on narrow streets and alleys for at least a quarter of an hour. Finally, when he was satisfied, he drove out of the city to the west, crossed the Virginia state line, and drew up in front of a house in a suburban area of Alexandria. Harlow felt like a lamb being led to slaughter as he followed Davarre up the walk to the front door. If things went bad he was willing to take his chances with Davarre; the man was small, and didn't appear to be as pepped-up as most supers. But if there was one more of them in the house, he was a dead pigeon.

THE DOOR opened and Harlow stood face to face with one of the technicians he had fired from his project for being drunk.

"Come in, Doctor," the technician said. "I've been waiting for you. Already got your drink mixed. A trichoma julip—that's what you wanted, wasn't it? Hope you don't insist on a chaser. I'm all out of cocaine—or do you prefer morphine?"

Harlow started to make a

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break for it, but Davarre touched him in the ribs with the point of a knife. There was nothing he could do at the moment but accept the invitation to enter, so he did.

He did his best to remain calm, as he was led into the kitchen of the house. He tried to remember what he could about his ex-assistant. He knew the man's name was Ashley, and that he had lived in Alexandria, Virginia. He could have kicked himself. The clue was available all the time and he had muffed it. Now he was in a trap. Harlow knew that he would be no match for Davarre in a test of reflexes, and it was obvious that Ashley wouldn't settle for a mere thousand dollars. He could see bitter hatred in the man's eyes.

"All planned, I suppose?" Harlow asked casually, as Ashley motioned for him to be seated.

"Only since Mr. Davarre's phone call," Ashley replied. "All my operators were warned to be on the watch for you. But that little pickpocket you bribed is not a member of my team."

"Team, you say! Got organized quick. How did you catch on, or would that be giving away classified information?"

ASHLEY shrugged complacently. "I've got nothing to hide from you—not now. I found out the hard way, same as you. I took a few tranquilizers when I began to feel on edge; the rest was automatic."

"How about the other boy who worked with us? Moreno, I think his name was. He in on this with you?"

"No. Moreno is trying to cut out paper dolls, along with your friend, Stauffer. I understand they're not too handy with the scissors. Which reminds me, Doctor—your drink."

He went to a sideboard and mixed a brandy and soda. Then he dangled a frond from a Martian fern in the liquid for a half-minute, eyeing Harlow all the while.

"More elegant this way, don't you think?" He held the drink out. "Of course if you prefer, Davarre here could rub a little on the back of your neck."

John Harlow's mind was

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racing frantically, searching for an escape. What effect would the brandy have? He didn't know. He supposed that taking the secretion internally would hasten the process. He didn't see what he had to gain from postponing the reaction anyway. Ashley would undoubtedly keep him tied up, or locked in a room somewhere during the early phase. Later, when the deterioration period began, it wouldn't matter where he was...

"What say, Doctor? Not thirsty? Rather have a little scratching on the neck?"

HARLOW lunged at the sneer on Ashley's face, and at the same time tried to knock the glass from his hand. Ashley barely moved, but it was enough; Harlow shot past without so much as touching him. He could hardly believe it. Ashley showed none of the usual characteristics of the super, but there he was, as quick as a cat—and he had been contaminated more than three weeks before.

Harlow's spirit of resistance left him. He couldn't fight two supers, especially not two like Ashley and Davarre. They appeared to have all the useful qualities of supers and none of the disadvantages.

"I guess you win," Harlow said weakly. "But I don't see why you're sore at me. I had no way of knowing that you weren't really drunk; you sure as the dickens acted like it."

Ashley smiled and handed Harlow the brandy tumbler. "I'm not sore at you, Doctor. And believe me, I do understand how you made the mistake. Anyone would have done the same. But now you're in my way. I have a little deal cooking, and you're the man most likely to put the fire out—so you have to go. You understand my position too, don't you?"

Harlow held the glass but didn't drink. He wanted to stall as long as possible, though he didn't know what good it would do him. He had given up hoping that one of Rafferty's men had been able to follow him. In his heart he knew that if he got out of this trap he would do it on his own.

"By the way, you seem to have refined the technique," he said to Ashley. "You and

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your friend here don't seem to be as jumpy as most of the cases I've studied."

Ashley motioned to Davarre and the Frenchman came forward and took the glass from Harlow's hand. A moment later, John Harlow felt something cool against the nape of his neck. It was followed by a light scratching. Davarre was rubbing a Martian frond against his skin.

"I didn't have to be quite as careful with my guinea pigs as you, Doctor," Ashley answered him. "And you're right. I have refined the technique. Watch."

He picked up a needle and jabbed it into his palm. His eyes didn't flinch.

"See, no pain. After all, we can't have the future rulers of the planet over-sensitive to pain. They'd be too vulnerable."

HARLOW let his jaw sag as he assumed Ashley expected him to. "Rulers of the planet!" he exclaimed. "You have got a deal cooking. How do you plan to take over—by recruiting pickpockets at five hundred dollars apiece?"

Davarre scratched him a little harder. Harlow was trying to ignore what was happening to him, but inwardly he was beginning to feel sick. He knew now that he should have let Rafferty handle the cloak and dagger phase. He wasn't cut out for it.

"There'll be a place for everybody," Ashley said, "and it isn't as melodramatic as it sounds. But to answer you truthfully—no, we don't expect too much from ex-pickpockets. Their five hundred dollar fees are helpful right now with the finances, and we'll need a rank and file, as the army says, but the key figures will come from higher levels, obviously. This is no beer-hall operation. Too bad we can't trust you. You could probably move our schedule ahead a week or two if you were with us."

HARLOW grimaced ruefully. "A few more passes across the back of my neck and I'll be on your side, won't I?"

Ashley laughed. "No, I'm afraid not. This hormone, or whatever it is—and I'll admit to you, Doctor, that I don't know what it is—brings out some of our traits, but it

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doesn't really change our basic character. If you aren't a revolutionary at heart, we can't use you."

Davarre finally stopped scratching and Ashley told him to get a piece of rope from a closet in the laundry. Davarre went after the rope, leaving the door open behind him.

Now or never, John Harlow thought, as he sprang from his chair.

This time, he didn't try to grab Ashley on the first jump. He pretended to, but he stopped short just inches away. Ashley moved confidently to one side, dodging what he thought was Harlow's desperation lunge. Instead of being off-balance, Harlow was ready for him; he struck out with a sharp jab, hoping to catch Ashley in that infinitesimal moment before he could dodge again.

He almost succeeded; he felt his knuckles brush Ashley's chin, but it was only a glancing blow. It was enough to jar Ashley off-balance, however, and Harlow tried another jab. Unfortunately he was a little off-balance himself that time, and Ashley recovered first. Again Harlow felt his knuckles graze the other man's chin. Then John Harlow felt Ashley's rapid jabs against his own face.

Ashley must have hit him a hundred times before he went down. He felt the blood gushing from his nose and heard a singing in his ears. Over the singing, he heard Ashley say, "Hurry up with that rope." Then the singing grew louder and he closed his eyes wearily.

VI

WHEN HE awoke this time, it was to find himself lying on the floor, securely bound and gagged. Not only were his ankles and wrists tied, they were tied together, and behind him. His back was arched painfully, and the gag bit into the corners of his mouth. He couldn't have felt more helpless if he had found himself falling from the top of the Washington Monument.

He was still in the kitchen of the house in Alexandria, but Ashley and Davarre were gone. The light had been turned off, but the room was

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not black. The first signs of daylight came in through the window. That meant that he had been unconscious for at least four hours, maybe more. Less than two hours to go! If he didn't get a treatment within two hours, he was finished.

It might as well have been two days, or two weeks, he thought, as he tested the rope around his wrists. Then he heard the voices.

They were subdued, and obviously came from a distant part of the house, yet he could understand most of what was said. The discovery thrilled him; it meant that he was a super again.

ASHLEY was doing most of the talking.

"...there are almost two thousand of us now," Ashley was saying, "and it's time we got started. We've already got men planted in the cigaret factories and coffee companies. Here's a list of the brands that will be contaminated starting day after tomorrow—Thursday, that is. Pass the word along. Nobody smokes any of these brands, or drinks any of this coffee, until you hear from me.

"Now the doses are mild. The first symptoms will appear in about ten hours. After that they'll have about ten more hours to buy a treatment. That means we have to start advertising by Friday. We'll hit the papers, and radio and TV, and the magazines with ads that won't mean anything except to the people who are beginning to feel our symptoms. A treatment costs five hundred bucks—more if you think the patient can go it, but five hundred is the minimum. It's five hundred or the booby hatch.

"We have enough doctors to handle the treatments, but each doctor will have to be well guarded. I figure six of your men can handle any number of G-men who might show up, in case they get curious—as I'm sure they will. Remember now, we know nothing about contamination. We just developed a treatment for an ailment that seems to be going around. Understand?"

THERE WAS a murmur of assent. John Harlow estimated from the murmur that in the room, maybe a few

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more. Probably, the nucleus of the whole gang was right there in the house, and he was helpless to do anything about it.

"Then we sell to anybody, is that right?" a voice asked.

"We collect from anybody," Ashley corrected him. "But we'll be very choosey who gets the real treatment and who gets a drink of water. We don't want any scientists—they'd just give us trouble. There will be ample time to train our own scientists later on. We do want bright, healthy kids between sixteen and twenty. They'll be most susceptible to the training program. We don't want any politicians, and we don't want any old people. Soldiers and sailors are okay, but no high-rankers. And, of course, we wouldn't be so brutal as to let a slick chick go to the nut house just because she didn't have five hundred bucks."

"Now you're talkin'," somebody said.

"Okay, it's almost daylight," Ashley hurried on. "Let's spread out. Remember now, we don't meet here any more. You have the new address. See you there Friday, midnight. Should have plenty to report by then. And remember what I said about keeping your eyes open for guys who speak foreign languages—especially Russian. We want to get our overseas agents going before somebody beats us to it."

HARLOW was absolutely dumbfounded. In a space of three weeks Ashley had not only conceived of a plan to take over the entire planet, he had actually set up the organization to do it. And his plan was sound. Increasing large sections of the country would be at his mercy in a matter of days, if he succeeded in contaminating coffee and tobacco. Did Ashley actually have enough of the deadly ferns to do it? Harlow didn't know; he didn't know how much would be required. Maybe only an infinitesimal amount, given enough time, and no treatment. It was unbelievable—those skimpy little ferns, as Voigt had called them...

The scraping of chairs across the floor, and then the shuffling of feet brought him to the realization that now John Harlow definitely had to do something. He didn't have the

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slightest idea what it could be, but it was life or death now.

The shuffling of the footsteps extended to the front of the house. He heard the first sounds of automobiles being started. One by one they drove away. He counted four. Then he heard Ashley's voice again, this time from outside.

"Get my bag from the bedroom. I'll check on the doc, then we'll take off."

HARLOW heard a door open and close, then another door, then the sound of footsteps approaching the kitchen. He tested his bonds one last time. He felt strong—stronger than ever before in his life—but the ropes wouldn't give an iota. The frustration almost brought tears to his eyes.

Ashley came into the kitchen and bent over Harlow, raising his eyelids one at a time, just as Larkin had done in the hospital.

"All right, Doctor, quit your kidding," he said. "I know you're awake. Open your eyes."

Harlow opened his eyes.

"I have to leave you now, Doc," Ashley said, with mock sadness. "I want to thank you for giving me this great opportunity. Someday, I'll erect a plaque in your honor. *'John Harlow, sucker'*, I'll put on it. That okay by you?"

HE BENT down and slapped Harlow across the face several times. The blows stung, but not as much as Harlow thought they might. Apparently part of his system had developed an immunity—maybe the effect could be controlled completely—so people could have super-sensitive reflexes without the accompanying susceptibility to pain. These thoughts went through Harlow's brain in an instant; nevertheless, he was disgusted with himself for thinking of such things at a time like that. He forced himself to concentrate on Ashley. The sneering face was only a foot away, but that foot was like a mile. Then Ashley reached down to slap him again.

Harlow put everything he had in a tremendous lurch and caught Ashley's hand between his knees. Instantly he clamped his knees together fiercely and rolled over, dragging Ashley off balance. Ashley recovered

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immediately and began beating his fist against Harlow's ribs. Harlow had no freedom of movement at all. There were only two things he could do: Hang on to Ashley's hand that was trapped between his knees, and roll about on the floor. Everything else was excluded from his mind. He pressed his knees together until they became bruised, and he thrashed about on the floor like a beheaded chicken.

His head struck a table leg and the pain made his eyes smart. His elbows became raw from banging against the floor. But he gritted his teeth and clamped his knees harder against Ashley's hand.

AFTER A while, he no longer felt any pain in his head or in his elbows; he no longer felt Ashley's fist pounding into his ribs. He felt nothing but Ashley's hand caught between his knees. Unexpectedly, he had discovered a new power of the super—the ability to concentrate all energy and all feeling in one part of the body. He was actually draining his system of every ounce of energy it possessed and forcing it into the muscles of his legs.

He didn't know how long he had been dragging Ashley around on the floor when he finally realized that his opponent's body had gone limp. He strained his neck to look at Ashley's face.

It was horrible. His nostrils were dilated, and blood poured out from ruptured blood vessels. His mouth was drawn back in agony, baring his teeth. There was a deep cut on his cheekbone where his head had hit the sharp corner of the stove. Worst of all were the sickening noises coming from deep inside his chest as he tried to catch his breath. Even as Harlow released him, Ashley gave up the battle and rolled over onto his back. Harlow listened for his breathing, then for his pulse. Both were quiet. Ashley was dead.

SLOWLY, Harlow squirmed himself free of the man he had just killed. The sight of Ashley's hand almost nauseated him. The flesh was entirely gone from it. The fingers were mashed and broken as if they had gone through a press...

Again he heard footsteps ap-

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proaching the kitchen. He had forgotten about Davarre. Apparently the entire struggle with Ashley had only taken a few seconds, and Davarre was only now coming to investigate.

Harlow had no plan for dealing with Davarre. It was too much to hope for that he would get another break as he had with Ashley—Davarre would be on his guard. Had it all been for nothing after all?

He lay on the kitchen floor and waited, his eyes focussed on the door.

When it opened the beam from a flashlight played about the room, paused on Ashley's body, then flipped over to Harlow.

"Well, look who's here?" a familiar voice called out.

The light was turned on and Harlow looked up into the faces of Rafferty and two of his G-men.

IT DIDN'T take Harlow long to rub the circulation back into his arms and legs, once he was freed. In a matter of minutes he felt wonderful. Better still, he didn't have the compelling urge to run around conquering people and setting up new world-orders that he had had before.

"I hoped you might have followed me," he said gratefully, "but I was afraid we lost you. Why did you wait so long? I might not have been so lucky, you know."

Rafferty looked at him with wide open innocence. "We did lose you. I didn't know you were within miles of this place until I opened this door a minute ago. We followed Larkin."

John Harlow was puzzled. "Larkin? What's he got to do with it?"

"Your case must have interested him more than we suspected," Rafferty said. "Shortly after you left the hospital, a large shipment of drugs was stolen. The evidence all pointed to Larkin. We knew he wasn't alone in whatever he was doing, so we began trailing him. When he showed up here this morning for a meeting, we waited until it broke up and nabbed the entire gang. Now suppose you tell me what you're doing here."

HARLOW told him, and also told him about the

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coffee and tobacco scheme. A search of the men had already turned up several copies of the list of contaminated products, so Rafferty got on the phone and issued a stop order on all their shipments.

"Now what?" Harlow wanted to know. "Looks like you got the leaders of the gang—how do you go about catching the rest of the two thousand?"

Rafferty winced. "We don't have a single lead," he admitted. "Maybe one of these guys will talk, maybe not. You got any suggestions?"

Harlow shook his head. "I'm all out of suggestions. I just want to pick up my wife and get back to Connecticut. I'll take a ride in to Washington if somebody's going that way."

Rafferty gave him the ride, and tried to help him relax by not talking about the case. He turned on the car radio but Harlow couldn't stand it.

"One of the hazards of this affliction—I can hear too well sometimes. Would you believe it, I can hear that trombone player's lips move when he takes a breath between notes?"

"I believe it if you say so. You'd be a challenge to a Hi-Fi manufacturer, wouldn't you? I don't think I want any part of..."

"That's it!" Harlow shouted excitedly. "Hi-Fi, that's the way we'll catch them. With high frequency sound—the way they run mice out of buildings. It'll drive them crazy."

Rafferty didn't need any more; he had once studied audio engineering himself. "Don't worry, we'll make it loud enough. I can be a devil when it comes to manufacturing noises."

AND THAT was the end of the threat from the Martian ferns—for the moment.

Secretly, Harlow made a super out of Ellen, and from then on they stayed pretty much to themselves. During the debate in Washington he was called in to give his opinion, and he suggested that if the U. S. didn't legalize supers some other country might—but nobody seemed to worry about that. Harlow didn't worry about it particularly either. He was only too happy to get back to Connecticut to his lab—and to Ellen.

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gift from the stars

by Kate Wilhelm

illustrated by ORBAN

One old man stood between Talbot and Talbot's lifetime ambition — one old man with a secret he was willing to share. But how would Talbot use the truth?

MR. TALBOT didn't have to look far to find the shop. It stood out among the closed and boarded windows as if it were lighted with neon, which it wasn't. On one side of it was an antediluvian theater shut down since vaudeville's unfortunate demise, and flanking

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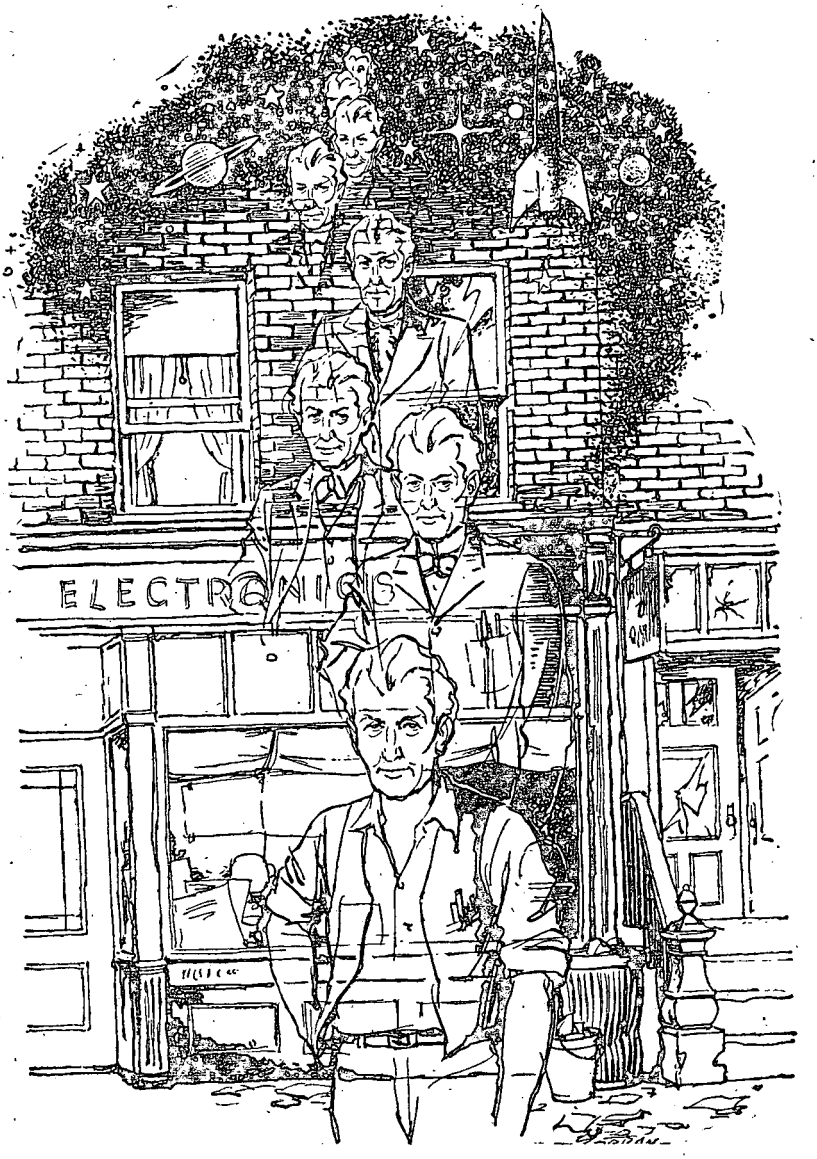

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the other side was a sign reading *No Charge For Labor,* telling its own story of long years of disuse. It was the same along the block in both directions and on around the corners on the adjoining streets. The several blocks had long been sold, closed, boarded, their former owners by now firmly established elsewhere. All but the shop.

The building housing it was a shotgun affair. Fifteen feet wide, it was squeezed in between the others as though it had forced them to move to allow it in—and even so had barely made it. The building left a scant six inches on either side of it, not sharing the outer walls as did so many of the buildings in the city. It was two stories high, and merged with the shadows in the rear—making it impossible to discover immediately just where it ended. The roof was of clay tile such as is found in Mexico and neighboring states, but seldom in New York, and the outside was stucco in appearance.

It was clean and neat—not at all a hazard, as Mr. Talbot had hoped. He frowned slightly as he surveyed it from across the street. The windows were waist high, in the manner of a century earlier, and were hung with cheerful blue and white curtains, making it hard to see inside from any distance. Only the door curtains were pulled aside, uncovering the glass. The panes sparkled and gleamed in a city where nothing was clean the day after the grime was removed, and the curtains would feel fresh and crisp to the touch. He was certain it was so; it reminded him vaguely of his grandmother's kitchen back in Pennsylvania when he was a boy.

On the door was the neatly lettered sign, *Open,* and under it another, *Repair Shop.* Below that sign, another listed the specifics: *Television, Appliances, Radios, etc.* It was the "etc." that annoyed Mr. Talbot no end. He removed his watch and deliberately hit it against the lamp post that was his support at the moment. Then, with a gleam of anticipation in his eye, he advanced toward the shop. He would see for himself.

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A SMALL bell tinkled in the manner of Swiss Melody bells for a second as he stood in the doorway, allowing his eyes to become accustomed to the comparative gloom inside.

The room he found himself in was bisected by a mahogany counter, shiny from countless years of usage and polishing. Behind it were numerous shelves of various sizes, holding heterogeneous items obviously left there for repair. There were portable radios and several t. v. sets, irons, and coffee makers, and toasters. There was a music box with a ballerina, standing poised ready to begin her whirling; she looked as though she had come direct from a Degas painting. Each item was carefully labeled, and he could see the dates and prices for the work done penciled in on the labels. The prices seemed fantastically cheap. For the first time, he began to doubt his theory that the shop covered up a racket of some sort. It had been the only reason he could think of why the owner refused to sell. He was startled by the appearance of the man from behind the curtains that separated the outer room from the back of the building.

Talbot was five feet six inches with his shoes on, which made him a good four inches more than nature had meant him to be; but even so, he was several inches higher than the other man. And he was younger. In an age where it had seemed at times that there wasn't anyone left older than he, it came as a distinct shock to see a man, not only shorter, but older. It gave Talbot a feeling of immeasurable superiority to stare at the other man, as—unconsciously—he stretched to further the advantage of his several inches.

"May I help you, sir?" Although polite, there was none of the obsequious in the man's tone.

"My watch. I broke it. Talbot thrust the watch toward the man and awaited his reaction. The crystal was splintered, and the minute hand had fallen to the pavement when he had banged it against the lamp.

"Hm. Dropped it, I suppose. Pity." His finger lovingly handled the watch, as if merely

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touching it gave him pleasure. "Fine watch. Don't see this kind very often any more." He gently pried off the back and bent over it with his jeweler's eyepiece in place, murmuring all the while he worked over it.

MR. TALBOT studied the other man surrepticiously. He hadn't known exactly what to expect, but certainly he had not expected this. From the reports he had received about the shop the old man must be at least ninety; Talbot would have to look up the dates again. But this man couldn't be the son. He was obviously too old for that, despite his green eyes and smooth face—something about his expression perhaps, or the startling whiteness of his shock of hair. Talbot averted his eyes quickly as the old man raised his head from the ruined watch.

"I think it will be all right now, sir." And he handed it back again, pointing with a pencil. "I'll have to keep it to grind a new crystal and replace the hand, you understand, but otherwise it's all right now. That spring there," and he touched it with the point of the pencil, "was broken, and I replaced it. There was some displacement of the other spring, but it hadn't broken—merely bent a little." His eyes were emerald green as he smiled at Mr. Talbot and retrieved the timepiece, affixing a label to it.

Talbot felt his mouth sagging and closed it with a snap. "Hmph. How soon will it be ready?" he asked gruffly, adding, "That crystal was hand ground, you know."

"Naturally. Many years ago I saw a lot of these, but recently they seemed to have disappeared entirely. Pity. Much is sacrificed by mass production."

Secretly, Talbot agreed; but he couldn't very well admit it to this person, so he grunted and left without another word. Had he looked back, he would have seen an amused smile play across the unlined face of the proprietor.

BACK IN his office, Mr. Talbot roared at his secretary, "Get Brigley up here!" He swung around in his chair and glowered at the city

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spreading out in every direction as far as he could see from the top of the Talbot Building. It was his city. He had built a good part of it and planned to build more. He had hotels and restaurants and office buildings and apartment houses. And he had two city blocks, had spent twelve years acquiring the deeds from the various owners, but now he was ready. The plans and permits were waiting to be used. The contractor was awaiting his call. All ready—except for a tiny shop of no consequence. He scowled ferociously as he heard the soft whisper of the door as it opened to Brigley.

"Mr. Brigley, how long have you been working for me?" He didn't turn to face the attorney, but continued to stare out over the city.

Brigley knew that tone too well not to know he was in for something, and accordingly he swallowed the pill he had snatched from his desk before answering the summons to the inner den. He said, "Fourteen years, sir." It was in the approved manner of a slave addressing his lord.

"Mr. Brigley, our association will terminate in precisely two weeks unless you can make some progress in the purchase of that shop. Now get out of here. I don't care how you get it, but I want that block—and I want it this month." He did turn then, and his face was so malevolent that whatever Brigley had started to say was stillborn in his throat; he departed hastily.

THE ATTORNEY was busy the following days, no longer trusting his hirelings for the task—as had become his wont in the recent years.

"Look, Mr. Brigley, we can't condemn it simply because your boss wants us to. It's in perfect condition—built like the gold vault at Fort Knox. It'll be there long after we're both dead and forgotten. And the old man's a licensed electrician and has more up-to-date wiring than most of the hotels in town have." And more slyly, "Besides I heard Old Man Talbot supported the other side last election. Don't guess he swings much weight at city hall any more."

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And later. "Sorry, Mr. Brigley. Like to help an old pal, but you know how it is. What with the investigations going on in the senate, and the D. A. making things rough right now, we can't—touch the old man. Maybe in a year or two. He oughta be protected all right, and we'll be sure to get his name on the list in a year or two when things settle down again."

And later. "Gee, Mister. That place just wouldn't catch on fire any place I tried. And honest—when *I* can't get 'em to burn, they just won't burn."

And later. "Had it staked out all week, but the old man don't show, see? They say he lives upstairs and never goes out at all, and they must be right. Never even seen him. Delivery trucks go around back with supplies for the shop and some kid brings him groceries. No dice there, though. The kid is as skittish as a colt when you try to corner him about the old man."

AND LATER. Brigley eyed the two men uneasily. They were too anxious, and the younger of them seemed hopped up to the eyebrows. He kept licking his lips, as if he were anticipating a feast. His smile was on-and-off, so rapidly that watching his twitching face made Brigley feel ill. They were both under twenty. He moistened his own lips and whispered to them, "Don't forget now. Be sure you get him to the back room before you start anything. I'll stay back here in the alley and see to it that no one goes in the back way, and you lock the front door after you enter."

They muttered obscenities at him and swaggered toward the street, leaving him alone in the alley way behind the shop. They hadn't seemed interested in who he was, or why he wanted it done—only in the hundred he had given each of them, and the second hundred he had promised them afterwards. He tried to make out the time, but the alleyway was already too dark for him to distinguish the numerals; he contented himself with the knowledge that sometimes the very young made the best accomplices after all, because

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of their impatience. They wouldn't loiter when there was money to be had.

One old man wouldn't take them very long. They would ransack the place, naturally, for salable loot—but that wouldn't matter to Brigley. The plan was that they were to leave by the back door when the job was done, and collect their money from him; after he left, he didn't care what they did to the place.

It grew darker, and Brigley began to pace the narrow alleyway more nervously. There hadn't been an outcry, so they must have accomplished their purpose. He supposed they were going over the place before they let him off the hook. His hands were very moist as he repeatedly placed them in his pockets and withdrew them. He wiped his face with his handkerchief for the tenth time, and suddenly couldn't stand it any longer. Cautiously he peered down the deserted street both ways before emerging from the alley. A car turning the corner and screeching its wheels nearly made him collapse, and he clutched the boarded-up front of the theater for support until it was again out of sight.

There was a light in the shop now, throwing a golden rectangle out on the darkened sidewalk. Hesitantly he paused before it. They should have put out the light. Someone might think the shop was open and find it strange that no one was there to open the door. He glanced down the street again, and then quickly stood on his toes to see above the drawn curtains into the shop.

OLD MR. DELIMARCARIOS was bending over a figurine on the counter top, his hair gleaming as it reflected back the light. It gave him an aura of saintliness. He was working on a statuette of a horse and rider. Deftly he was replacing the rider on the back of the animal, completely oblivious of the man staring through the window at his silvery head. Only when Brigley had gone did he permit himself the same amused look that had followed Mr. Talbot from the shop.

Brigley returned to his hotel apartment to face the bitter fact that, on the following day,

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he would be searching for another job. Not that one would be hard to find, he reassured himself; but he had grown accustomed to the protection of the Talbot fortune backing his nefarious deals, and it would be hard to go back to practicing law again.

He smiled sardonically at the note from his wife asking for fifty dollars. It was perced against the decanter of scotch that was his first stopping place when he entered the apartment. She knew how to reach him when she wanted to go shopping. That was when he discovered that his wallet was missing. In a blind panic he began pacing the floor. Those kids! They must have snitched it from him, must have decided that he was a much better plum than the old man. When the phone rang, Brigley was ready for them, but not ready for the hysteria that made the voice on the other end all but unintelligible.

"Mr. Brigley! What happened? What did he do? We're in California! You gotta help us!"

It became more coherent as the other one took the phone. "Listen, Brigley, if this is your idea of a gag, you'll be plenty sorry. The old goat got us aboard a jet or somethin' and got us to California. Now you get us back, and it's gonna cost you plenty before you're through with us."

Brigley dropped the receiver blindly back on the stand and groped for the scotch. In a numb sort of way, he believed them. But just to be sure he called back the operator and confirmed the fact that the call had come from California. He ignored the pealing of the telephone as he sat sipping the whiskey, trying to figure it out the remainder of the night.

THE NEXT morning, his wife put him to bed and called the office for him. Very slowly she hung up the phone, her face setting in furious lines as she surveyed his snoring, odiferous frame with contempt. Coldly methodical, she began packing her things. Losing the Talbot job meant that Brigley had only one direction to go now—it was down all the way,

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and she wanted out of it. She knew he would awaken feeling the need for the scotch as he hadn't felt it for years—fourteen, in fact—and it might be weeks or months before he straightened out again. Maybe he wouldn't be able to stop at all this time without her there to help, but she didn't intend to wait it out this time.

Mr. Talbot read of Brigley's suicide with only one thought in mind: the land couldn't be bought. But there were ways and ways. And he was familiar with many of them.

Talbot's hero from history was Napoleon, and he emulated his idol as much as possible. He, too, was the conqueror. Only—unlike Napoleon—he meant to remain undefeated from start to finish. His battles were fought in the courts of law, and in side deals under the desks and tables that divided him from his goals. No one had ever held out for long when Talbot was driving for his predetermined objective. Small in stature, like Napoleon, large in achievement: such was Talbot's description of himself, via ghost writer, for one of the slick magazines doing personality sketches of the builders of New York.

From his office in the Talbot Building, he could look up to the Empire State Building, and it galled him to have to do so. It was only right that the tallest and best should bear his name—be a standing, living monument of his greatness, for all of mankind to admire and respect. That was his dream. He had the plans, and the land. To be stopped by one plot, a mere sixteen feet across, was unthinkable. Ultimately he would gain that, too, even if it meant outliving the old man. Angrily he pushed aside the intruding thought. Ridiculous, he told himself; there was a way, and he would find it. He riffled through the papers on his desk while he waited for the detective he had hired.

"I'M NOT RESPONSIBLE for anything Brigley did, or anything he tried to do. I told him he was fired, and whatever he did was on his own." The fool. Leaving so much evidence around. "You know he took his own life after his wife left him?"

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The detective nodded and Mr. Talbot shrugged, adding, "Probably was deranged a long time and being fired was the last straw. Now what else did you find out?"

"Well, aside from Brigley's attempts to get to the old man, there's really very little activity concerning him that I could uncover. The land's been in the family since 1734. Several historians have recorded it as one of the first land transactions still documented and on file. It's been transferred from father to son ever since then, regular as clockwork. Every sixty years, the title changes hands from one Delimarcarios to the next. This one's named John. Had it for forty three years. Must have a son about somewhere. No trace of him, or a birth certificate or even a marriage license recorded for John. Might be some help there."

Mr. Talbot simply glowered at the detective and chewed on his lips. "Go on," he said finally.

"That's just it, Mr. Talbot. There isn't *anything*. There's never been a complaint about his work. Reputation is spotless. Only thing at all suspicious is the volume of mail he receives, and the amount of the telephone bill each month. There's a lot of long distance calls, some even from overseas."

"Calls? Who would be calling him long distance?" Interest flared in his eyes as Talbot studied the man opposite him. "Ever do any wire tapping?"

"Nope. And don't intend to start."

They haggled over the price and eventually the operative agreed to give Mr. Talbot a transcript of each call received at the shop.

THEY TRIED a Greek interpreter, and a Syrian, and a Russian, and Egyptian. Before they were admittedly defeated on the calls, they had called in translators for every language for which they could find a translator. Each left in turn shaking his head.

"What do you suppose they are?" The detective stared morosely at the tape recorder as the discordant sounds rose and fell. It was a language;

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there were words in strange voices and more words in Delimarcarios' voice. But undecipherable.

"He's a spy. I knew there was something crooked about him. Must be Siberian, or something like that. I read that there are more than two hundred different dialects throughout China and Siberia." Talbot was jubilant, finally. "This does it."

"You can't use this as evidence of any kind. If the police find out that you hired me to do wire tapping, we'll both be in the soup." The detective hastily unplugged the machine and began wrapping the cord around it.

"Don't be an idiot; a hint is all that will be needed. When I go to collect my watch, I'll hear or see something suspicious and call the F. B. I. Let them do their own tapping. Far as I'm concerned, you can destroy that tape; in fact, perhaps you'd better do it right now." He watched as the recording was erased and readied for the next usage; and only after that did he call for his car to be sent around for him.

"AH, MR. TALBOT. How do you do, sir? Your watch is ready." Delimarcarios smiled gently as he ran a practiced eye over the shelving and located the watch. Carefully he laid it down on the counter top and looked expectantly at Talbot.

"Fine, fine. Good as new." Talbot strapped it on and forgot about it, a new suspicion forming quickly in his mind. "How do you know my name? I didn't give it to you?"

"That's right, you didn't." The old man paused hesitantly studying the financier at great length. Finally he said, "Mr. Talbot, I'd like to show you something and explain a few things to you. Perhaps you would change your mind about acquiring this particular property if you knew why it means so much to us."

Talbot wasn't a timid man, but he had learned to practice caution. He glanced dubiously at the shop keeper before he answered, "Only for a minute. My secretary knows where I am and she would become worried if I didn't come back when I told her to expect me. She

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might even call the police or something."

"Very wise for a man in your position. But it won't take over a few minutes. This way if you will." He led the way to the rear of the shop then without a look back to make sure Talbot was following.

THE REAR of the shop consisted of benches and shelves piled high with tools, and items in the process of being repaired. There were coils of delicate copper wire, sets of screwdrivers ranging from mammoth in size down to near microscopic. There were lathes both metal and wood, and saws and drills. Talbot was fascinated in spite of himself. It was the most complete shop he had ever seen. But Delimarcarios was beckoning him down a stairway to the basement, and he followed, certain that the old man wouldn't attempt anything against him physically.

The basement was stacked high with cartons. Replacement for appliances, the old man explained and led him still deeper into a sub-basement. This time it was by way of elevator, and Talbot got his first intimation of personal danger. Any organization that had elevators going down so deep under the city shouldn't be tackled singlehandedly, he told himself mutely; but the door had closed, and backing out was out of the question. It seemed to take several minutes before motion ceased and the door silently opened.

Here it was different. The room was white and gold and gleaming. One wall was apparently paneled in rows of lights blinking and winking. "A brain," Talbot whispered, unaware that he did so.

"Not really, Mr. Talbot. But we do have to keep computing constantly so we can locate our receiver. You see, Mr. Talbot, we're sending messages to our government...Not of Earth," he added.

It was then that Talbot saw the second man. This one was shorter than his co-conspirator. He couldn't have been over four feet six inches, if that much. He was seated before the giant board with its myriad lights; and now he laid aside a curious head cap that had given him a pixyish look and

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joined the two by the entrance of the room. He looked inquiringly at Delimarcaios.

"I decided to enlist Mr. Talbot's aid. He is an intelligent man, and very reasonable. I'm sure that if he is made aware of the importance of our continuing our work, he will gladly withdraw from the scene and allow us to proceed unhindered." The second man looked doubtful but didn't comment and went back to his high stool before the communication set.

"AS YOU SEE, Mr. Talbot, this is to us what a short wave set is to your people. Many years ago, it was decided that some day Earth would advance to the point where it could be accepted as a member of the Universal Government. But it didn't appear expedient to send ship after ship here to check on it, so this means was chosen to keep the Council advised on the progress being made here. Volunteers are sent here to work for a certain number of years and then are recalled home being replaced by others."

"Sixty years." Mr. Talbot interrupted hoarsely.

"Oh, you checked. Yes—that's correct. In seventeen years my tenure will end here, and another Delimarcarios will take my place. The name means 'communicator', by the way."

He looked whimsical, and smilingly suggested that they return to the upper level. "Just in case your secretary gets worried, you understand. Another time, when you can stay longer with us, I'll show you around and explain the process of sending messages across the spaces to you. And also, you will want to see our rapid transit system, for getting our agents back to their posts quickly on the rare occasions when they feel they must report in person."

In silence they rode the elevator back to the basement and ascended the stairs to the rear of the shop. Talbot eyed the older man with a new respect as he asked, "And you receive messages from all over Earth, and send them on to your people?"

"That's right. Our men and

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women out there gathering data stay on Earth for shorter periods—only ten years in most cases—and they report on all phases of your life. From the advances in medicine to atomic research to working conditions. It all proves very helpful."

"I mean, do you have the only one like this on Earth?" Talbot motioned toward the lower part.

"Oh, I see. Yes, this is the only one. There are certain difficulties, naturally, connected with our agents in some countries, but we manage to keep in contact, nevertheless." He reached high on one of the shelves and brought down a decanter and two glasses.

Absently, Talbot accepted the drink the man placed in his hand and with only part of his mind he heard the following words. Talbot was a man of quick decisions—building a multi-million dollar estate was evidence enough of that. And now he had made another choice. Really he had no choice, this man had agents in other countries—including Russia, no doubt. That made him a spy. It shouldn't be too hard to establish the connection. He caught the last words Delimarcarios was saying.

"... so naturally being a patriot to Earth and to your own country, you can understand why our work is so important. You are a good deal like us in physique, you know—taller even than the average person of our country. I am sure that your intellect is also a good deal like ours. The Universal good takes precedence over personal gains." He held up his glass and proposed a toast, "That the Earth may join the community of worlds in the next hundred years."

They drank, and Mr. Talbot found himself walking away from the shop.

THE MEN at the F. B. I. office said they would investigate.

It was a week later when a personable young man presented his credentials to Mr. Talbot for inspection. His name, he said and the identification bore out, was Keith Winters. He smiled easily as Talbot launched into a tirade at the

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red tape and slowness of the investigation.

"Mr. Talbot," he said quietly, "I have here some twenty six names of youngsters to whom Mr. Delimarcarios is a foster parent under the U. N. program of providing the necessities of life for war orphans. That's why he gets so much mail from abroad, and why he gets so many phone calls. He is very active in this particular field. And very generous." The young man sat back and waited for Mr. Talbot's reaction.

"You fools! They aren't c h i l d r e n—they are adults, *short* adults. That's why they only stay here for ten years. They must begin to mature and can't pass for children any longer." He stared incredulously at the investigator. "What about the language? How do you account for the fact that no one can understand it? You did tap his wire, didn't you?" For a moment, the prospect of coming out second best nearly overwhelmed him, and his voice grew shrill.

"Mr. Talbot would you mind coming down to the office with me? My chief would like to talk to you and we'll clear up this thing for you down there."

It was an invitation of the sort that one doesn't generally refuse, and Talbot wasn't very different from the average citizen in recognizing the authority of the F. B. I., when it made such requests.

He shook hands with the chief, Mr. Heustis, and repeated his former question. "Mr. Heustis, why is it that your people are willing to overlook the fact that the calls that man gets are in no known language?" At the questioning look on the face of the government man, he admitted brusquely, "All right. I had it tapped myself. Didn't want to incriminate the operative I hired, so I didn't mention it before. What we heard was actually the entire basis of my suspicions."

"I see. Who was the detective who did it?"

TALBOT told him, and Heustis nodded to Winters, who left silently. "Tell me about the calls, Mr. Talbot." Heustis calmly leaned back in his chair and listened without

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interruption while Talbot recounted the experience with the tape recorder. Then he said simply, "Very interesting."

They waited, with nothing else being said until Winters returned nearly half an hour later. Heustis followed him from the office after excusing himself. It was a long five minutes for Mr. Talbot before he returned again. At his heels was the detective Talbot had hired. When he saw his former boss he hung his head sheepishly.

"Well?" Heustis snapped, "Tell him."

"It's this way, Mr. Talbot. When you said I should tap the wire I knew I'd be messing with Federal stuff and like I told you, I wasn't about to do anything like that. So I thought—what the hell, I'd fix something up for you that couldn't get nobody in trouble. You'd a kept trying until you got someone to do it, and I figured that way I'd just put a stop to it." He shifted his feet and glanced toward the door longingly. "I jumbled a tape myself. I played one backward and recorded it speeded up, and it came out like we heard."

"I don't believe it!" Talbot screamed jumping to his feet in a purely reflex action. He ran to the detective and attempted to lash out at him with his fists, "You're lying! Tell them the truth! You're lying!"

The detective held him back easily saying, "Hell, Talbot, you don't have to get sore about it. I can't help it if the old man's straight."

THEY WERE separated and the detective sent on his way. Heustis said soothingly, "Relax, Mr. Talbot. We'll check with the interpreters you hired, but if none of them could identify the language, chances are he really did it. Our own translators reported that each child uses his native tongue, and Delimarcarios is obviously a natural linguist."

His tone said that as far as he was concerned it was finished. "You did your duty by informing us of a condition that appeared suspicious to you. You were very commendable in that respect—however our investigation in no way confirms your theory that

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Delimarcarios is a foreign agent."

"I know he isn't a *foreign* agent, you blundering idiot. He's an agent of another world. All his spies are small as he is, even smaller. He passes them off as children...". Talbot stopped, aware of the exchange of glances between the chief and his subordinate—pitying glances. A cold fury replaced his violent rage instantly, and he became Talbot the tycoon who got whatever he went after.

"I didn't tell you this earlier," he said rationally, realizing that only the truth would keep them from courteously ushering him from the office. "Mainly because I knew you wouldn't believe it, it sounded so melodramatic. And, I didn't want Delimarcarios to connect me with you people. I as much as told him I would cooperate with him. He showed me his broadcasting room with a giant computer that keeps up with the constantly changing position of his world, where his messages are received. And he has what he calls a rapid transit system for transporting the agents. He practically admitted that he has reports from Russia regularly."

He saw that they were trying hard to suppress their smiles, and his attitude became even more frigid, "If you will listen to the ranting of a madman for a few more minutes I'll try to explain it to you as he did to me." They were unimpressed afterward and in desperation he suggested that together they visit the shop and be convinced through the evidence of their own eyes.

After a reluctant glance at the papers on his desk, Heustis agreed, obviously only to get rid of him. During the ride to the nearly-deserted area of the shop Talbot expanded on his description of the sub-basement and its contents. It was he who led the way into the shop.

DELIMARCARIOS looked anxiously at Talbot as they entered the shop. There was a worried pucker between his eyes, and he looked older than before. It must have been in the way he walked, more drawn and much slower. He

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asked, "Is something wrong?"

Heustis interjected smoothly. "What could be wrong, Mr. Delimarcarios?"

"The watch? It's still working, isn't it?"

Savagely Talbot snapped, "You can drop the pose, Delimarcarios. I told them all about you. These men are from the F. B. I."

Delimarcarios looked at them blankly for a moment. It was Heustis who broke the silence. "Mr. Delimarcarios, would you mind if we take a look around?" He added kindly at the look of confusion on the old man's face, "You don't *have* to allow it. We have no search warrant."

"Please...whatever it is you want, if I can help you in any way... Here, come in, come in." With a perplexed look at Talbot, he held back the drapery over the door and they went into the rear of the shop.

"Not up here." Talbot urged, "This way. You have to go down to the basement. He pointed to the open door and the stairs leading down.

Heustis looked apologetically at the old repairman who said, "Here, I'll turn on the lights for you."

The basement was brightly illuminated and extremely neat as was the whole shop. Talbot turned to the elevator.

It wasn't there. He looked suspiciously at Delimarcarios. "You might as well bring it up. You can't hide an elevator, you know."

Delimarcarios looked enquiringly at the Federal man, "Please," he said pleadingly, "What is it you want?"

"I told you, you old fool! I told them everything! All of it!" Angrily Talbot began pounding on the floor where the elevator had been. "It's under here. The top of it must fit in the floor."

Heustis and his aide began half-heartedly looking at the floor also. Disgustedly the young man said, "Chief, this is solid concrete. There's not a crack in it. Besides an elevator needs cables, doesnt it? Where are they?"

They looked at Talbot. They waited.

"They have it! I was in it. They're smart enough to travel in space and send messages.

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They could conceal an elevator, couldn't they?" They didn't say anything and he shrilled at them, "It's here! I saw it, don't you understand? I saw it!"

HIS FACE was contorted and very pale as he looked from one to the other of them and suddenly with a wild cry he threw himself on the old silver haired man, knocking him down, clutching at his throat. "Where is it? Tell them about the radio set." He was still screaming hysterically when Heustis and Winters finally pulled him off the semi-conscious Delimarcarios.

They explained a little of it to the shop keeper while they waited for the ambulance. Mr. Talbot sat handcuffed to a chair, tears of frustration dimming his eyes. Over and over he kept repeating, "They could hide it if they wanted to."

Delimarcarios shook his head sadly. "I am at fault, gentlemen. When I observed him deliberately smashing his watch across the street, I assumed he was just an eccentric. I should have notified someone then that he needed care."

They had been gone nearly two hours when Heustis returned to his desk to face overtime work to get the papers cleared out. He looked quizzically at the young man, "Think he'll snap out of it?"

"Doubt it. Who'd ever thought such a little guy could swing a right like he could?" He nursed his jaw ruefully. "He really did smash his watch against the lamp post. Shards of the crystal were still there."

"Never can tell what it will take to crack a mind. He wanted to build that skyscraper so badly that he made up that story and made himself believe it just to get a piece of land."

Back in his shop Delimarcarios turned the *Open* sign to read Closed and humming happily to himself locked up. He rode down the elevator still humming. To his companion before the communication set he said, "I made him a gift of truth. With such a gift a wise man can change a world, but a foolish man—he can only destroy himself."

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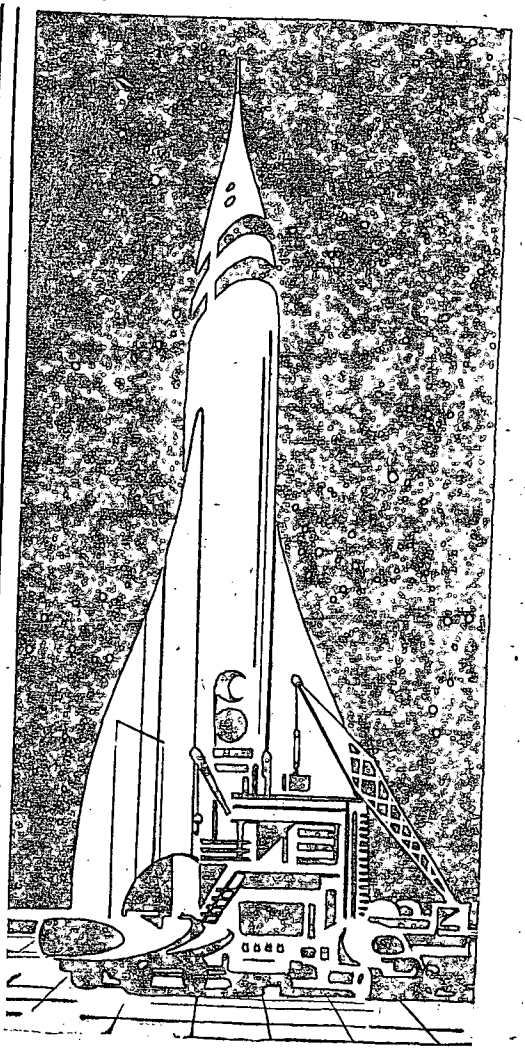

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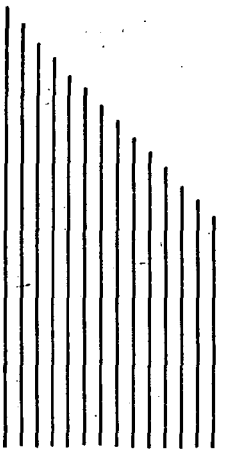
The Race Into Space



1. Operation Bootstrap

What's holding us back right now is the fuel problem. There are several possibilities, some of them in use, some still to be explored. Here's a breakdown on where we stand at the present time.

SOME MONTHS ago, a reporter asked Dr. S. Fred Singer, "Dr. Singer, when we finally land on the moon, what do you expect to find there?"

"Russians," Dr. Singer replied.

The race for the moon is on. No one will deny that now, nor will you find anyone foolish enough to argue that the Russians do not have a formidable lead. With satellite launchings an almost work-a-day accomplishment, the rocket programs of both the U. S. and the U.S.S.R. have turned to the problem of an unmanned shot to the moon or its vicinity.

The Russians have had a moonshot program for some time. They call it "Project Boomerang" and it's under the guidance of Professor G. A. Chebotarev, who is well known for a paper considering the best method of establishing a fifty to one hundred kilogram (110 to 220 pound) payload in an orbit around the moon. Sputnik III, launched just a week before these words are written, fully confirms the rumors of a monster Soviet rocket, capable of developing from 100 to 250 metric tons of thrust. Such a rocket, given a well designed guidance system, can easily land a significant payload on

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the moon...say, a final stage carrying an H-Bomb marker.

IT IS MY personal belief that in the five months between writing these words and their actual appearance on the newsstands, the Soviet rocket men will have successfully landed a rocket on the moon, or established one in orbit around the moon. This doesn't take the talents of a Cassandra to predict. It has now been fairly well established that the Russians have tried a moonshot twice already. The March, 1958 *Missles and Rockets,* a respected professional magazine, announces that excellent sources of information have confirmed the first attempt. Other sources of information indicate this first try was on November 7, and that at least one subsequent unsuccessful attempt was made. The frustrating thing about all this is that we are not now even in the race. Our nearest competitor to the Russian monster is the Air Force's "Atlas", which probably won't be operational for from six months to a year at the least.

We are still, I hope, in the race to land the first manned rocket on Luna, however.

Yet, with all of this talk of moonshots, rockets, ion drives, photon drives and the like turning the front pages into something resembling the contents page of *Science Fiction* January, 1941, you still run across the celebrated innocent who asks with wide-eyed wonder, "Yes, but how can a rocket work in space when there's no air for it to push upon?"

THIS GENTLEMAN is perfectly at home with such esoteric matters as ion drives, anti-gravity, photon drives, because they obviously can't work in an atmosphere, but a rocket now...well....

So, you and I—we're going to talk about space drives. Not just rockets, although rockets will obviously occupy a great deal of our time together. We're going to dig into some of the meat of present-day rocket science, talk about thrusts, specific impulses, heats of reaction, nozzle theory, all the stuff that gives a rocket engineer grey hairs. Only, I hope we won't get grey hairs doing it. Actually, the concepts

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themselves are easy; easy as addition and subtraction (though, in my time, I've run across math that floored me completely, even though I could spot an occasional plus or minus sign in it.)

Basically, every space drive so far elaborated in theory is a reaction engine. There are no exceptions, unless you count anti-gravity—which hasn't been elaborated in theory—and Verne's space gun—which others have debunked far better than I can in this small a space. Such books as Willy Ley's wonderful *"Rockets, Missles, and Space Travel"* and Oberth's exciting *"Man Into Space"* (Cf. Bibliography at the end of this series.) discuss the principles of the reaction motor in more detail than I think appropriate here.

For our purposes, we can say that a reaction motor depends on Newton's third law of motion which says that for every action there is an *equal* and *opposite* reaction. Translated into rocketry, this means that if a rocket throws out a mass with a certain momentum, the rocket will assume an equal momentum in the opposite direction. Since momentum is defined as the product of mass times velocity, you get a sort of lever or see-saw effect in the balance. A ship, weighing 1000 pounds, throws out a pound of gas, moving at 1000 mph; and as a result, the ship moves forward one mile per hour. That is, the velocity of the ship times the mass of the ship equals the velocity of the gas times its mass or (1 mph) x (1000 pounds) = (1000 mph) X (1 pound.)

IN ACTUAL practice, of course, the ship does not throw out a reaction mass in a single chunk, but rather as a continuous stream, which means that the ship is constantly getting lighter and constantly increasing its speed. To get around this, we apply calculus to get a formula with which we can work. However, the basic principle remains the same. (For the math bugs in the audience, figure 1 gives the derivation of the basic reaction equations.)

Since the rocket is strictly a reaction engine, it will work anywhere. As a matter of fact,

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rocket motors are now being used underwater. Actually, a given rocket design will develop more force or thrust as the outside pressure goes down, its thrust sometimes increasing as much as thirty per cent in going from sea level to outer space. The V-2 motor, for instance, developed 56,000 pounds of thrust at sea level but nearly 66,000 pounds at 100,000 feet. The rocket engineer may treat this pressure

FIGURE I

DERIVATION OF THE BASIC ROCKET EQUATION

Since the change of momentum of the ship at any instant is the same as the change of momentum of the exhaust gases at the same instant, we may write:

$$m \frac{dv}{dt} = \frac{d(MV)}{dt} \quad (1)$$

where m and M are the masses of the gas stream and the ship respectively, and v and V are the velocities of the gas and ship respectively. (Note that the effects of air resistance and gravity are ignored in this development.)

But since the change of momentum of the ship, $\frac{d(MV)}{dt}$, may also be written as $-c\frac{-dm}{dt}$, the expression for the momentum change of the gas stream (both momentum changes being, by definition equal), in which -c is the velocity of the exhaust gas (negative because of its direction with respect to the motion of the ship), (1) becomes:

$$m \frac{dv}{dt} = -c \frac{dm}{dt}$$

or, as a differential equation:

$$mdv = -cdm$$

or:

$$dv = -c \frac{dm}{m} \quad (2)$$

Integrating (2):

$$\int_{V_o}^{V_t} dv = \int_{M_o}^{M_t} \frac{dm}{m}$$

Thus

$$\left(v = -c \ln m + K \right)_{M_o}^{M_t}$$

$$V_t \; V_o \quad (3)$$

or, evaluating (3) for the boundary conditions:

$$V_t - V_o = c \ln \frac{M_o}{M_t} \quad (4)$$

Equation (4) will then treat the mass and velocity ratios of a rocket between any two points in its flight.

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thrust effect with the following equation:

$$F = \frac{\left(\frac{\dot{W}}{g}\right)}{} V_2 + (P_2 - P_3) A_2$$

where F is the thrust or actual pull of the rocket in pounds, $\dot{W}$ is the propellant mass flow rate in pounds of propellant per second, g the gravitational constant, 32.2 ft/sec/sec, V_2 the velocity of the exhaust gases, P_3 the outside pressure, 15 pounds per square inch at sea level and zero in space, P_2 is the pressure of the exhaust gases and A_2 the cross-sectional area of the exhaust as it leaves the rocket nozzle.

THE PART of equation (1) to the left of the plus sign merely restates the relationship of force, mass, and acceleration which you learned in high school physics. The most interesting part of the equation for this discussion is that to the right of the plus sign. This tells us that as P_3, the atmospheric pressure goes down, the right hand term becomes bigger and hence the thrust becomes greater, just as we expected. (Actually, for the most efficient use of the energy in a particular fuel, the engineer tries to design a rocket nozzle which will deliver exhaust gases at a pressure equal to the outside pressure, that is, so that P_2 equals P_3 and the right hand term becomes zero.)

We said earlier that all space drives were reaction motors, that they were devices to impart energy of motion to a mass, and throw that mass to the rear at a high velocity. Right at the moment, our sole workable reaction engine for space flight is the chemical rocket. The important thing to remember about a chemical rocket is that it is nothing but an overgrown heat producer and exchanger. It takes a high energy fuel and tries to burn that fuel as efficiently as possible, to milk it of as much energy as it can; then it tries to convert as much of that heat energy into motion within the gases that result from the burning, and throws them through a nozzle. This nozzle, incidently, is a device to expand the issuing gases as much as possible

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since, if the gas stream is properly directed, this is the best way to get the most velocity out of the gas. (There'll be more on nozzles later.)

A ROCKET is completely self-contained. It needs no air as does the jet, since it carries its own oxidizers with it. This oxidizer is usually oxygen which may be present in pure form—in the form of high oxygen inorganic compounds which yield oxygen on heating, or feed the oxygen directly into the burning reaction—or the oxygen may be built directly into the fuel. Whenever a bond is formed between two atoms in a compound, that bond may give off heat or take up heat. The chemical reactions in a fuel system between oxygen and other materials causes bonds to break and to re-form between other atoms. The extra heat from these bond exchanges is the heat we want for our rocket and, as we shall see later in this series, the nature of these shifts in bonding put a definite limit on the amount of energy we can ever expect to get from chemical fuels.

THERE ARE presently two general types of chemical rockets, the liquid fuel rockets and the solid fuel rockets. (Figure 2 gives a general schematic of each type.) The trend in military rockets is increasingly to the solid fuel rocket, in spite of the lower energy content of solid fuels as contrasted with liquid fuels. The main reasons for the trend lay in the stability and storeability of the solid propellant and in the ease of preparing and launching a solid fuel rocket.

Most of our military liquid fuel rockets use LOX, liquid oxygen, as their oxidizer. LOX has a boiling point of -183° C (-297.4° F.) which makes it pretty cold stuff. You can't store it in a rocket for any length of time without arranging to replace the LOX that continually boils away. Because of its low temperature, it may cause valves to freeze, relays to stick, pumps to jam, and missle men to jump off tall buildings. It has a further disadvantage which is obvious if you've seen the first Vanguard failure. When a solid propellant rocket blows up, it

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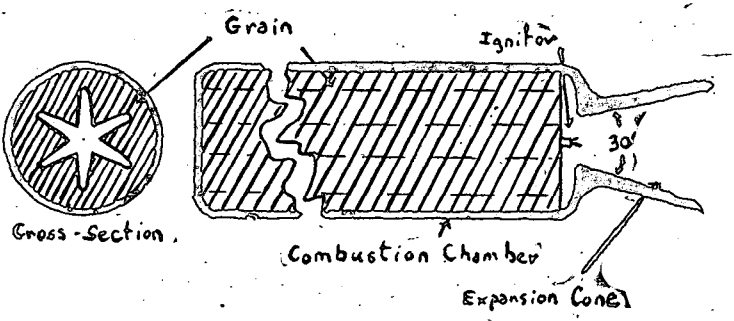
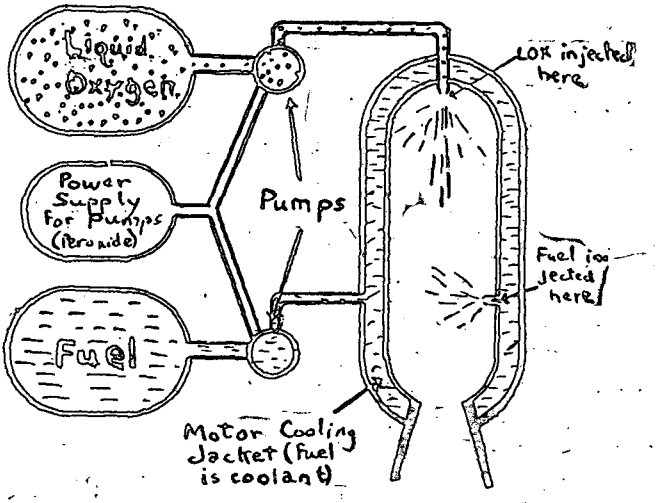
FIGURE 2



TYPICAL SOLID FUEL ROCKET

(Note that the grain is case-bonded to the motor wall and is pierced by a star. This design maintains a fairly even burning surface and hence fairly even pressure.)



TYPICAL LIQUID ROCKET

(Power for pumps may be furnished by decomposing hydrogen peroxide, gas generators, etc.)

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generally stops burning. LOX-liquid fuels keep right on burning and making it hot for anyone in the area. This is the only argument that the Navy needed for going to solid propellant missles, for obvious reasons.

There are other liquid fuels, of course, some of which have a very convenient property of spontaneously igniting when they are brought together in a rocket motor. Aniline and fuming red nitric acid, which are used in the Navy's *Aerobee*, is such a combination. Others are unsymettrical dimethyl hydrazine and fuming nitric acid and hydrazine and concentrated hydrogen peroxide. However, both aniline and hydrazine are poisonous, the latter extremely so and both are absorbed by the skin. Suffice it to say that fuming red nitric acid isn't the safest material in the world itself. It exhibits an appetite for all metals on dilution and for all organic materials—flesh included—that makes you wonder if it isn't a working model for the universal solvent.

SOLID PROPELLANT rockets can be stored for months and years without appreciable change in their ballistic properties. The solid fuel rocket is easier to construct, too, since it dispenses with the complicated plumbing, and pressurizing systems of the liquid rocket, and substitutes a single piece of oxygen-rich fuel (called a grain, regardless of its size), surrounded by a pressure-resistant combustion chamber opening to the expansion nozzle.

One obvious advantage the liquid fuel rocket has over the solid fuel rocket is in inert weight. The liquid motor need be only large enough to handle the amount of fuel being injected into it, while the solid motor must be big enough to enclose the entire fuel supply. Of course, the weight of pumps, storage vessels, and plumbing in the liquid rocket partly offsets this advantage, while the use of case-bonding techniques in the solid rocket that allow the fuel to add its strength to the walls of the combustion chamber helps to lower the solid rocket's weight.

ONE OF THE big headaches with solid propellant grains

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stems from expansion and contraction, both in the curing process and afterwards, when the grain is subjected to wide ranges of field temperatures. During the curing process, the solid grain goes through a chemical or physical process that hardens the grain and gives it greater mechanical strength. The changes that occur within the grain may cause it to swell or contract, resulting in cracks, flaws, and imperfections in the case-bonding. Such a crack or imperfection will increase the burning surface—and consequently the combustion pressure—above that for which the motor was designed, often resulting in an explosion. These problems are magnified with large grains. The Aerojet General Corp., for instance, has developed an elaborate testing and quality control program to screen out any flawed "Polaris" grains. The "Polaris" is designed to be fired from a submerged submarine and an underwater "Polaris" explosion would have the effect of several direct hits by depth charges.

While the solid propellant rocket has quite a number of advantages over the liquid fuel rocket in military applications, the reverse is true in the area of space flight. Liquid fuels inherently are able to develop more energy per pound than solid fuels. This, coupled with the weight advantage in hardware, more than compensates for the other disadvantages of liquid fuels. Moreover, liquid systems have another major advantage over solid systems in that they can be more easily controlled.

THE LIQUID motor can be cut off simply by closing the fuel valves, stopping the fuel flow—and consequently, the thrust of the motor can, though somewhat inefficiently, be controlled in the same way. Solid fuel rockets, on the other hand, have a burning rate characteristic of the fuel itself and the internal combustion pressure, while the thrust for a given nozzle design is determined by the interior geometry of the grain—that is, by the amount of surface exposed to the flame. It is possible to control these factors within narrow ranges by variable nozzles and pressure vents, but the

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resulting motor is clumsy and inefficient. A solid motor can be stopped under certain circumstances, before its fuel is exhausted, by venting the combustion chamber suddenly.

Most solid propellant rockets operate with combustion chambers in the range of 500 to 2000 pounds per square inch. If the internal pressure drops, burning rate decreases. If the pressure is dropped to outside pressures suddenly, the flame front may be torn from the grain and the burning extinguished. Personally, I have a feeling that the man who is willing to ride a solid propellant rocket controlled by any of these devices is braver by far than he is smart.

IF IT COMES to a chicken-or-the-egg contest, we'll have to agree that solid propellants were known before liquid fuels, unless you want to count Heron's aeoliphile, but the water in that one was probably converted to steam by a solid fuel. The first rockets, then, were the crude black powder rockets of the Chinese. Wm. Congreve, whose gadgets contributed "the rocket's red glare" to the lyrics of *"The Star-Spangled Banner"*, improved on the hardware of rocketry quite a bit; but his propellants were still basically the black-powder formulations . . . sulfur, salpetre, willow charcoal . . . that the fireworks manufacturers had been using for years. The really important high-energy solid propellants were developed during World War-II and after. There was the JPN formulation . . . nitrocellulose, nitroglycerine, etc. . . . which was used in the bazooka and larger rockets, the GALCIT series developed as JATO fuels for the Navy by the Jet Propulsion Laboratories of the Gugenheim Aeronautical Laboratory of the California Institute of Technology (Guess where they got the name GALCIT.) and many others.

ALL OF THE propellants developed during the war and up to the present fall into four broad categories: (1) single base fuels composed of nitrocellulose with various solvents and stabilizers (2) POL powders composed of nitrocellulose and DEGN, diethylene glycol dinitrate, with a plas-

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ticizer (3) double base grains, patterned after Alfred Nobel's double base powders (e. g. Cordite) and composed of desensitized nitroglycerine and nitrocellulose with solvents and stabilizers (to take up acid decomposition products) or plasticizers, depending on how the grain was to be formed and (4) composite grains, composed of some solid oxygen-rich compound, usually inorganic, and a fuel binder that released a large amount of energy on burning.

The single base propellants and the POL powders are no longer of major importance because of their low energies. Until recently, when new casting methods appeared, the double base propellants (which included JPN) were being used less frequently because most of these were extruded under pressure which made it difficult to manufacture large grains.

The composite propellants are presently the most widely used of the propellants in large military grains. The GALCIT series was one of the earliest examples of a composite propellant. The fuel was nothing more than asphalt mixed with potassium perchlorate with plasticizing oils added. The potassium perchlorate, on heating, released about 46% of its weight as pure oxygen, which in turn combined with the asphalt, producing heat and some formidable clouds of white smoke. Since the GALCIT's, the roster of composite propellants has grown enormously.

THE DEVELOPMENT of composite propellants has been essentially a history of plastic and resin chemistry. Since the fuels used in composite grains do not contain their own oxygen, as does the nitrocellulose and nitroglycerine in the double base propellants, a solid oxidizer is needed to supply the oxygen; and the choice of these is severely limited. The oxidizer must have a rather large percentage of its weight available as oxygen; it must not absorb an undue amount of moisture from the air; the molecules it feeds into the exhaust gases must be fairly light in molecular weight, and preferably gaseous rather than solid; and it should be reasonably cheap. (Actually, the last

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requirement is becoming less important each day, as we try to crowd more energy out of a propellant. Propellant chemicals may often cost as much as a hundred dollars a pound in experimental quantities these days.)

THE PRINCIPLE oxidizers now in use are Ammonium Perchlorate (oxygen: 34%); Ammonium Nitrate (oxygen: 20%); Potassium Perchlorate (oxygen: 46%); Potassium Nitrate (oxygen: 40%), and Sodium Nitrate: (oxygen: 47%). Of these, ammonium perchlorate comes the closest to filling the bill. A whole class of ammonium nitrate propellants has been developed, but ammonium nitrate has three major disadvantages: Its oxygen content is low; it goes through two distinct volume changes at higher temperatures before melting; and it absorbs moisture rapidly from the air if the relative humidity is much above 41%. The picrates have been used to some extent, but the first two compounds, ammonium perchlorate and ammonium nitrate are still the most popular for high energy composite propellants. (The potassium and sodium salts mentioned have a disadvantage in that their combustion products are partly solids of comparatively high molecular weight. Later we will discuss the quantity called "specific impulse", by which the propellant chemist compares the thrust that a given weight of propellant burned over a given time will produce; and we will find that, as the molecular weights of the materials in the exhaust go up, the specific impulse goes down.)

While work is still being done on the GALCIT type of propellant, most of the binders now used draw from the more exotic areas of plastic and resin chemistry for their structure. One of the most important solid propellant companies, Thiokol Chemical Corp., has developed a whole series of polysulfide rubbers as binders while both natural and synthetic rubbers have also been used as binders in composite propellants. Besides these, the propellant chemist has developed propellants based on plastics and resins such as the polystyrenes, polyurethanes, the polyvinyls, par-

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ticularly the polyvinyl acetate and polyvinyl chloride resins, and so forth.

ALL OF THESE resins and plastics have two things in common: when they combine with oxygen, they release a great deal of energy and their formulations before curing are sufficiently fluid to cast into molds. All of these materials are what the chemist calls "high polymers"—that is, long molecules made of very simple building blocks that repeat and repeats like beads on a string. These high polymers may be long chains—as in the case of the polyvinyl resins—or they be long chains cross-linked down their length as in the polyurethanes. When the binder material is mixed with the oxidizer and cast into a mold, *the chains and the degree of* crosslinking are both low or non-existent. The process, called curing, increases the length of the chain and/or the degree of cross-linking which in turn causes a comparatively fluid material in the mold to become more and more solid. The resulting propellant material may vary in physical appearance from a stiff rubber or rough gel to a hard, brick-like material.

There are other types of binders being investigated at present, but most of this work is classified.

Besides the oxidizer and the plastic or resin binder, the composite propellant grain may contain a variety of materials to modify the burning rate of the propellant, its flame temperature and other such ballistic properties as well as to modify its physical strength, and elasticity. Carbon black may be added, for instance, to modify burning rate and to make the grain opaque. (A translucent grain may develop internal hotspots from infrared radiation penetrating the grain from the burning surface.)

HIGH ENERGY additives such as powdered zinc, powdered aluminum, boron, and a borane may be added to increase the propellants burning rate and to increase its energy. Powdered magnesium has also been investigated, but has not proved attractive at present—in spite of its favorable effect on the specific impulse

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—because of its reactivity with moisture trapped within the grain. The boron hydride, decaborane ($B_{10}H_{14}$), has proved of interest in solid propellants. Decaborane is the only presently-available borane that is solid and the current classified literature suggests that it might prove of value. The disadvantages of adding metals such as aluminum to the composite or double-base propellant lie in the nature of their combustion products. Aluminum yields a solid material, aluminum oxide, which has a fairly high molecular weight and, more important, has pronounced abrasive properties. In the same way the chromates yield abrasive chromic oxide. These abrasive materials tend to erode a rocket nozzle, and over longer operating periods, the properties of the rocket motor itself will change in an unpredictable fashion.

THE DOUBLE-BASE propellants have recently gained a new hold on life with the advent of manufacturing techniques which do not require expensive extrusion techniques and which do not require the use of clumsy casting powder techniques in which a casting powder composed of nitrocellulose and various modifiers is placed in a mold and a nitroglycerine casting solvent drawn up through the mold dissolves, gels, and finally solidifies the casting powder. (Needless to say, the solvent-casting method has another disadvantage. The casting solvent may often contain as much as 75% nitroglycerine and, though a desensitizer is present, the process still is not the sort of thing to guarantee a long life-span to the operator.)

One of the main attraction of the double-base powders is that the oxidizer is built right into the nitrocellulose and nitroglycerine molecules. As a result a double base grain is more homogeneous physically and contains less inert, non-energy-producing weight. The newer double-bases seem to have better physical properties and, in spite of the release of acidic decomposition products, better storeability.

IN SECTION two of "The Race Into Space", we're going to discuss liquid fuels, some

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of the methods of evaluating chemical fuels, and the future possibilities and limitations of the chemical fuel in space flight. Along with this, we're going to explore two of the more esoteric fields of chemistry to talk about both solid and liquid fuels based upon what the chemist calls free radicals and upon what the physicist calls meta-stable excited states. And after that, in part three, we'll talk about atomic fusion and fission drives, ion-drives, plasma drives, solarpower drives including the ressurrected concept of the clipper ship of space, photon drives, and anything else that sound faintly possible. Bring your slipsticks.

The Reckoning

As I've noted before, the presence of the article on the voting coupon doesn't mean that you have to vote on it; nor does its rating go in with the stories. "Point of View: Mercury", the second in the Asimov series, came out with a point rating of 2.66—which would put it in second place, were we to list it with the fiction. (About 75% of you marked it on your ratings.)

The cover comes out exactly tied between those who liked and those who disliked it.

Do you like the series of editorials on "Yesterday's World of Tomorrow"? Want it to continue? I know that some of you do—but others seem dubious. So I'd appreciate your indicating your preference on the coupon.

Here's how the August fiction came out:

1. The Earthquake Remedy (Mathieu)	2.38
2. Texas in the Sky (Embs)	3.14
3. The Song (Chandler)	3.27
4. The Last Threshold (Wilhelm)	3.38
5. Object Lesson (Groener)	3.61

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the new science of astronomy

by DONALD FRANSON

We're happy to present the first article to be translated from what appears to be a popular scientific magazine, included with the miscellaneous reading material packed in the "missile from outer space" that fell in Saskatchewan. Alarmists say that the government is training the armed forces in the use of lawn mowers and harvesting machines, just in case.

IT IS SCARCELY twenty years since the first rocket photographs of the world beyond the clouds were published; it is only eleven since the intrepid Reed burst into the unknown; it is less than two years since the space station was established—yet the study of this outside universe, called *astronomy,* has taken first place among the natural sciences, and is still growing. Only this year, more data has been obtained about the six known planets than in all previous years together, and "astronomers"—there is an expanding number of such specialists now—believe they will shortly find out the secret of the distant lights, said by some to be further planets or suns, too far away to measure.

Of all the wonders revealed thus far, the most wonderful is how wrong all our previous ideas of the universe have been. This youngest of sciences has revolutionized thinking in the other, older sciences—such as Venusology, meteorology, even biology. Yet all this new knowledge owes its existence to chance—to the meteorological

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study of the upper atmosphere (Professor Groves claims that astronomy is a *branch* of meteorology) by means of the newly developed rockets, just a score of years ago. Needless to say, the mechanical science of rocketry has progressed equally fast, after a long dormant period of disuse in war, and the two fields have intertwined in a mutually beneficial symbiosis.

Although all these things have been broadcast and taught in schools, the new facts come so fast that one can hardly keep up with them. Each one seems to overturn all previous theory, or complicate known facts so that new hypotheses must constantly be presented. For this reason, an article such as this would hardly be comprehensible without a resume of what has been learned so far.

PICTURE, if you can, the days of twenty years ago. Venus turned serenely, life went on about its business of growing, budding, wilting, and our minds were occupied with the latest novel of Hawthorn or musical play of Rose, or the game of rootball; or if we were scientists, we dabbled in botany or mathematics or mechanics, knowing there was nothing new under the bright patch of sky we then thought was the sun.

Then the rocket photographs. No one could interpret them, at first. It was only afterward that they were fully explained, and it was thought at the time that chemicals from the other instruments had gotten into the plates.

The pictures were mostly dark; that was expected, because they had been taken on the night side of Venus. But instead of the few meteor trails that had been predicted, they showed thousands of white spots. Later pictures were similar, but the real truth of the matter came only after Reed made his epochal flight. Let us accompany him, and hear his own words:

"I don't know what I expected, as I neared the altitude where the clouds were supposed to thin out. A universal brightness, I suppose, though the rocket pictures had shown a daytime scene that was the

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same as the night one. But I was totally unprepared mentally for what I saw before me. Thousands of little lights, in a totally black sky, though it was daytime! I had been warned the sun would be blinding, so I shielded my eyes with photographic shades. The sun itself was a little thing—not the white giant I thought it would be—yet it was intensely bright; with ten shades of darkness I was still able to make it out as a disc, but then was unable to see the lights again until my vision returned. I call them lights because they resembled a distant community all lit up. However, they were utterly motionless, of different colors and brilliance, and partly cloudy in places. These clouds are of light, apparently, not water, and are very faint."

LITTLE by little, as other expeditions—each one lasting onger—followed Reed's into he clear, more knowledge was ained. It was Wood who dis-overed that the four brightest ights, and one other, moved in elation to the background of ther lights; it was Barley who charted the sun's own movements, and the Laurel expedition which estimated the distances of the various nearby phenomena. But it remained for a Venusbound mathematician, Mulberry, to see the relationship between the various lights and Venus itself.

For, hard as it is to believe at first, Venus is not floating on the surface of an ocean of light, sometimes one side up, sometimes the other. It is free in black space, and all the light comes from the sun, which is the center around which Venus revolves, once a year. And Venus is not even the nearest to the sun! It is second; another of these moving lights called planets is closer and has priority. However there is no danger that this other world will get in the way and cut off our light and heat; space is so vast, and the planets so small in comparison, that this is of no concern.

Four other planets revolve outside Venus' orbit; these take a back seat to us. Three of these outside planets have other, smaller worlds revolving about them. Venus has none,

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that we can discover, besides the artificial ones that we have ourselves put up. So the universe is a complicated affair of wheels within wheels. All the other lights in the sky appear stationary, but it is thought that they may have motion also, only they are so far away that we have not detected it in the short time we have been observing them.

HOW DIFFERENT from the thoughts of the ancients, the middles and the moderns, even up to a decade ago! Gone is the white universe and the black universe, or the sea of light bearing up the worldly pod. Now we are getting at the truth, and it is a bewildering truth. But the greatest wonder is yet to be told.

For two of the other planets, which it has been discovered are like other Venuses, are inhabited, and by plants! The fourth one out, its surface always visible to our telescopes because it has no clouds at all, has areas on its surface that show the radiations of plant life. And the third one out, nearer to us, also shows its surface most of the time. It is two-thirds covered with apparent water, and the land areas are partly of a green color, the color of health! And both the water and land show life radiations. Something even more interesting has been discovered about this third planet; nothing more is known about the fourth beyond what has already been mentioned. Doubtless it has some unusual form of vegetable life, adapted to the fierce conditions of direct sunlight.

The third planet, also, gets direct sunlight much of the time. Its temperature, however, is lower than ours, due to its distance from the light and heat-giving sun. A special study of this third planet has been made, from the space station, in the past six months, which has revealed markings that appear to be artificial.

At first the actual time for study of outer space was strictly limited. But since the advent of the space station, it has been continuous, and that is why more has been learned in

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the past few months than in the preceding score of years.

PROFESSOR BUSH says there is a civilization of intelligent plants on the third planet, which has built cities and dams that are visible in their effects. Doctor Lemon disagrees; he puts forth the astounding theory that the civilization of that world may be of intelligent animals—but Lemon has always been known for his sensationalism. It is hardly likely that parasites could have developed in competition with thriving plants; and if there were no plants, what could the creatures live on? Doctor Lemon makes the lame explanation that unrestricted solar rays have inhibited the plants' development; this may be so, but why not the animals' too then? But there are unmistakable signs of civilization, even lights on the dark side of that world.

It is true that a world of animals is not unthinkable. There were animals roaming Venus in prehistoric ages. Even up to barbaric times, a few still survived; the emperor Juniper kept animals for his amusement, throwing his enemies to them, a cruel process of execution in which the victims were torn limb from limb and their leaves cut to bits and absorbed by the beasts. When this sort of thing was outlawed, the enthusiasm for keeping animals languished, for what could you feed them? They were strict vegetarians, and could not live on minerals. Zoos at first fed them live plants of a lower order; then as this was frowned on, dead plants. Even this was thought profane in comparison to fire or plowing under as a method of disposal. Finally, of what use were animals, except as curiosities?

Unfortunately, or fortunately, depending on which way you look at it, all animals were killed off in the "hard times" of a thousand years ago. In that strange economic era, caused mainly by world-wide disorganization, it was impossible to feed the animals or maintain the zoos.

WE COULD afford to keep animals now, but unfortunately (for science anyway) they are all gone, except the

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microscopic ones. It is a sad thing to contemplate the final extinction of these once decorative if not useful creatures, after millions of years of evolution; but one must remember they were all predators, producing nothing of their own, living only off other creatures. Indeed, in the far past, there were "carnivorous" animals, living off other animals. One might imagine the merely herbivorous animals being shocked at the thought of animals eating other animals, while they went on calmly and self-righteously munching plants.

Some paleontologists like to speak of an "atmospheric balance" in which animals consume the oxygen which plants exhale, and restore useful carbon dioxide to the air. However, animals are inefficient for this purpose, compared to fires and volcanoes; and in the opinion of Professor Sycamore of Ivy University, it is doubtful that such a balance ever existed on Venus, even in paleozoic times. Animals cannot live without plants, but plants can easily live without animals. We are doing it today without much effort, and have even increased Venus' supply of carbon dioxide, consuming waste oxygen by chemical means. Incidentally, the rocket creates another use for waste oxygen—it is a good fuel, along with natural oils and gases.

So putting aside all ideas of a prehistoric world of devouring animals, we still see the wonder of actual life on two other worlds, intelligent life on one of them. That brings up the thought that no doubt is uppermost in your minds; we have the rockets now to fly in; why not go there?

THE TRIP would not be so easy as that. Much preparation must be made, in spite of the near perfection now attained by the science of rocketry. A precise orbit must be figured out, the sun's effect must be considered (an item not necessary for the satellites) and the time element calculated. But astronomers and rocketeers now are of the opinion that such a trip can be made, and will be made, if we all lend a helping branch, and use the funds of scientific research

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that are now frittered away in classifying minute animals, or in obscure chemical experiments. As everyone has agreed from the first, astronomy is a *useful* science.

Before we send ourselves to the third world, a scout ship must be sent, without any pilot or crew. Astronomer Holly says that this first ship, little more than a guided missile, will serve as a messenger to the possible plants inhabiting the third world. It could be filled with books and informational gadgets capable of being deciphered with intelligent effort.

Then will follow the first, to our knowledge, expedition across space, to pay a friendly visit to our planetary neighbor. Perhaps it is not the first—the inhabitants of these other worlds, open to space, have had far more opportunity to think about the astronomical wonders than we. Why haven't they visited us then? We don't know.

IT IS POSSIBLE that the plants on the third world may not be friendly, and may attack us. The expedition must be equipped with the latest armament in the form of flame-throwers, chemicals, machetes and axes. Also spray-guns, in event of attack by small animals that could infiltrate into our sap, or damage us by diseases. In the unlikely event of attack by giant animals, we must have other weapons in readiness.

The conquest of space is a matter for careful seeding and much cultivation.

But just imagine the surprise of some experimenting botanist, dormant for twenty years, who might awaken in the midst of these busy preparations. What questions could he ask that would elicit, to him, a sensible reply? What are these preparations for? An expedition to where? How could there be another world? Beyond the clouds? How are you going to get up there? *By weather rocket?* It would take some time for all these revolutionary ideas to soak in and be taken up.

Yet all of this fascinating information is within the scope of this new, budding science of astronomy, undreamed of twenty years ago.

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Editorial

YESTERDAY'S WORLD OF TOMORROW: 1928 V

I CAN STILL recall my disappointment upon seeing the cover of the September 1928 issue of *Amazing Stories*. Not that I read science fiction in those days, (it was *Ghost Stories* that held my main fascination while newsstand browsing) but I did enjoy the fantastic covers and interior illustrations. And this new issue had a white background for a large design, which symbolized "Scientifiction".

In the April issue, a prize contest had been announced; readers were invited to send in sketches of designs for a symbol. One A. A. Kaufman sent in the First-Prize-winning sketch; and various features of the second and third winners were used in the design that was adopted. Well, here was the answer to those who had been complaining about the lurid covers—but my guess is that that issue showed a falloff in sales; and it would be another five years before the symbolic cover was tried again.

"Discussions" held about the same tone as we indicated in the last installment of this 1928 series. One reader objected to the numerous detective stories, which even then did seem rather hard to justify;

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they were mostly reprints of the doings of such "scientific sleuths" as Luther Trant. A few, such as the "Educated Harpoon"—a radio-controlled murder weapon—were tolerable. Another reader voiced the hope that reprints would be discontinued altogether; and, in fact, we were approaching the end of the early reprint series. "The Skylark of Space" (of which the second installment appeared in this September issue) was the first *new* serial to appear in the magazine; henceforth, the Verne or Wells reprints would be few.

HARL VINCENT'S "Ambassador From Mars" peoples the red planet with superhumans (super, to an extent; they're beautiful specimens physically, and they are the inheritors of a superior technology, as well as being far ahead of Earthmen in culture and civilization). It's more of a romance than anything else, but at least the author didn't try to make Mars exactly like Earth. Our hero is abducted by the Martians, and finds a friend who had disappeared some time back. This fellow tells him:

> "Three days ago you were kidnapped at my request. How this was accomplished is not entirely clear to me even now, although I was taken from the earth in the same manner. The Neloia are in possession of secrets which would be of incalculable value to the war-like countries of Visin. ...At any rate, there is a force which the Neloia understand and which was used to bring you from your park bench in the park to our space flier, about fifteen miles overhead. ...
>
> "...During the three-day period, you were also subjected to a number of hypodermic injections which have suited your body for life on Ulder. Changes have taken place in your system which make it possible for you to breathe the rarefied atmosphere and extract from it sufficient oxygen to live normally. Other drugs have altered the relation between your muscular

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power and weight, so the widely different gravitational effect on Ulder will not be noticeable. ..."

"Visin" is Earth and "Ulder" is Mars. It seems that the reason for the kidnapping is that their home planet is rapidly becoming uninhabitable, and the Neloia want to migrate to Earth. However, being a peaceful folk, and having studied Earth and its peoples, they need an ambassador; our hero has been chosen for the job. There's also another intelligent species on Mars, which is engaged in a life-and-death struggle with the humanoid peoples.

ALTHOUGH this story displays a welcome difference from the evil Martians which had been and were to be so prominent in science fiction, it also shows a familiar flaw. Despite the care Mr. Vincent went to in order not to make Mars just like Earth, and his then-new idea of *adapting* a human being so that he could live on Mars, the Martians and their civilization are not convincing. We are told that they are super-beings—far, far in advance of humans—yet our hero has no difficulty in understanding them once he learns their language. Their civilization is just a human-type Utopia; and, for all their superiority they have as much trouble with a primitive enemy as Earthmen would have. It's all very wonderful, but we're just in a strange country, really—not on another world.

The flaw was to be repeated *ad infinitum*, while the story's virtues would be overlooked; further tales of this sort ("superior" human Martians) would show the same failure of auctorial imagination. The fantastic element would be just stage directions for an ordinary adventure story, wherein the only reason why we should accept the Martians as "Martian" rather than "Earthmen" is that the author told us they were.

In addition, as with many other stories where the author tried to avoid the plot of bloodthirsty or villainous aliens, seeking to conquer or destroy Earth, it's all very mild. The

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story is a gentle travelogue, with much explanation and a little wild-game hunting, but no real suspense. There is an equally mild romance, without thought of any possible conflict arising from mutually-alien psychologies, etc.

"THE INVISIBLE BUBBLE" by Kirk Meadowcraft, manages to jam a large mass of mystic-science into about 4,000 words. Matter and energy interchangeable... strange intrusions of other space-worlds into ours... Forteanisms... space warps... a "Hole in the Universe"... a super, giant tube...

> "...The concentration of power within the tube is designed to set up a condition of excessive strain within the portion of three-dimensional space in which it acts, a strain that I have reason to believe, once set up, will remain more or less permanent."

So Dr. Sylvester sets the thing going, noting that the "rays" produced very nearly approach the magnitude of the cosmic rays of Millikan.

> "...They are apparently harmless to life but they seem to be closely associated with the dimensional relations of matter."
>
> As we approached the tube we saw forming in its centre a small bubble, black and with no trace of lustre. No light could pass the etherless space that had been blasted apart under such tremendous force. As we watched, it grew until it nearly filled the tube.

This is what is termed the "Quintessence of Nothing" or the Hole in the Universe. Needless to say it gets out of hand and absorbs some innocent bystanders. Dr. Sylvester makes another bubble, puts a rabbit into it.

> To our wonder we saw the bubble, having absorbed into its nothingness the living object, slowly lose its dense obscurity and become less and less—saw it become a shadow—tenuous—saw the be-

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ginnings of translucency, as though by some substance newly dissipated through it—and then to us in the silent laboratory came the screams of the animal, but very faint.

SO THEY know that the rabbit is still alive; and this explains how they could still hear the crying of the little boy who was swallowed up by the *invisible bubble that got away* the day before. You see, the globules of hyperspace seek each other out—flow together; and we wind up with the terrifying conclusion that:

> "There are in the universe certain motions and reactions that are *unbalanced*—that tend toward a certain end from which nothing can divert nor arrest them. Such is the rush of the whole known universe through space from an unknowable start to s o m e inconceivable goal. Such is the gradual dissipation of energy throughout the known universe..."

I'm sure you can guess the end. The experimenters decide that it's all too horrible and hopeless. And if you deduced, still further, that the well-meaning scientist is somehow captured by the invisible bubble—so that, once the narrator has busted the works and burned all the papers, *no one* will be able to explain or repeat the experiment, you can give yourself a 100% score on this one.

Here we have another failure of imagination, although the description of the capture of the child is very telling, and the general mood well done. But the failure is the failure of the sorcerer's apprentice; a science fiction author has started something he can't handle, even fictionally. So his only solution is to decide that it's all too horrible for anyone to know about; thus he makes sure that all the devilish apparatus and information is destroyed at the end. He has planted the fact that the scientist is such an incredible genius, his magnificent mind so tremendously far in advance of anyone else's, that no one could possibly stumble on this ghastly truth so long as he leaves no trail behind him.

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I'M NOT OUT to flog Kirk Meadowcraft, whose "Invisible Bubble" makes fascinating reading even today, for his contribution to this genre is about the least reprehensible of these I've read. Let's look at the reasoning behind this "Horrors! Burn the notes!" line.

1. *The unknown may be dangerous.* Entirely true, and proven time and time again. 2. *Experiments may get out of hand and cause harm.* No doubt about this; and unquestionably it happens now and then. 3. *We may discover things we don't understand and can't handle.* Right again; in fact, you might say that the first man to discover that he could kill people at a distance from which the victim could not lay his hands upon his attacker, discovered something that Man has not yet been able to handle, or really understand. *Therefore: when we do come across something of this nature, we must destroy all the information, so that no one else can discover it—only thus can we protect the world.*

Wrong, positively wrong. It this sort of thinking (adapted to military necessities) which has cost us dearly—and some people still think that Russia has atomic weapons *only* because spies and traitors stole or gave away the secrets.

And, of course, there's often the "God did not mean for Man to learn this" line, which is as good theology (and as good sense) as the line that God did not mean for Man to fly. To paraphrase Bishop Sheen's reply to people who are afraid to go up in an airplane, it's an insult to God to use this approach. In effect, you're saying, "So long as I keep out of this, God, you can't touch me!"

Please note that "God wanted us to learn how to master ourselves before we uncovered the riddles of space, time, and matter" is an entirely different argument.

LET'S CONSIDER the "invisible bubble", and assume that it can be produced and after production will behave exactly as Mr. Meadowcraft relates. Is it "unknown"? Yes, to a large extent; more important features seem to be un-

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known than known about the bubble. And we have seen that it's dangerous. Can it get out of control and cause harm? It not only can, but has. Can we handle it? Not too well; it's far from safe.

Well, then, *shouldn't* we do just what they did in the story? *No!* Dr. Sylvester has accumulated and tested some data on the bubble; that data may be valuable. Destroying it will not guarantee that no one can duplicate his experiment. (It isn't the sort of experiment any amateur can attempt in his back yard or basement.) The information that has been collected may help a subsequent experimenter to *avoid the errors* that Dr. Sylvester made; if a later experimenter starts from scratch, he may merely *repeat the initial errors in a more dangerous way.*

But shouldn't more work on the bubble be discouraged until we know more? Ah, that is quite a different question altogether. Dr. Sylvester's report would be helpful in indicating the areas of ignorance already proven dangerous in this field; it should be available to others working in related fields. Contrary to fiction, there are no "mad scientists" who are both determined to destroy the universe, or the human race, and capable of doing so.

The free flow of information among working scientists, therefore, does not increase the dangers of investigating "forbidden knowledge, etc.," but rather introduces safety elements which might not exist otherwise.

IN "UNLOCKING THE PAST", David H. Keller, MD, investigates the proposition of "inherited memory"—which was not a new idea in 1928, although Dr. Keller's handling of it is particularly his own. An infant is given the "treatment", and starts to talk at once about experiences of former lives. Since this is all too horrible to the infant's parents, the "treatment" is undone, and the little girl becomes just a happy "goo-gooing baby" again.

There's no denying that the story does have an emotional impact; truth to tell, I'd be horrified myself at seeing an

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infant carry on thus. However, all this is somewhat beside the point—the fact of the matter is that Dr. Keller has done nothing with a fascinating idea, except to say that it shouldn't be done.

"The Great Steel Panic" by Irvin Lester and Fletcher Pratt deals with bacteria that attack metal; it seemed sound and sober then, and though the story could not be handled the same way today, it was good for its time.

THE OCTOBER issue had a cover illustration, showing a robot grappling with a lion in a park. The robot had been disguised as a man, but the lion managed to rip off the mechanical's clothing, etc. Paul's cover shows wearing apparel bestrewn around, while the robot straddles the lion, and... my sympathy for the outmatched beast will not permit me to continue.

It was an effective cover, however, illustrating J. Schlossel's "To The Moon By Proxy". Our crippled scientific genius can't go to the moon in his home-made spaceship; so he sends the robot, watching the trip via video. This was the first instance where a robot is used to go places where Man cannot (or a particular man, in this instance) and relay the data back to those who are watching and guiding it. The robot in the story is radio-controlled, as were robots in general at the time; the robot which could think and move for itself, once given a task to perform, was still to come in the magazines.

"THE VOYAGE to Kemptonia" by E. M. Scott has space between here and the Moon well filled:

> "These little satellites, which may be fragments of our own, or other more distant worlds, hang suspended, as it were, in the depth of space; and as they are on the edge of, or just beyond the limits of the earth's atmosphere, they are subject to the attraction of both earth and sun. And as the sun's attraction is just sufficient to prevent their falling on the earth, they remain

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fixed in space but continue to revolve around the earth.

"The majority of these satellites are too small and infinitesimal to be of any consequence. But after long continued telescopic explorations, among these worlds, I have discovered one of them that is infinitely larger than its fellows.

"...Kemptonia revolves around the earth, in a regular orbit and is about thirty miles distant from our globe. This little follower of the earth travels through space at the rate of about three miles per minute, requiring approximately six twenty-four-hour days to complete its orbit. It also revolves upon its own axis, as does the earth, but much more rapidly, considering its relative size. But more of this later, when I will show you this satellite."

Yes, indeed, Professor Kempton. We would all like to see this flatly-impossible satellite. (If the speed is correct, then it cannot have the orbit stated; if the orbit is right, then the speed is wrong. As described, Kemptonia just wouldn't be there.) We would also like to know why no one has ever seen any of the smaller satellites.

ON THE OTHER hand, "Reprisal" by Thomas Richard Jones is rather good science fiction for 1928. The story is supposed to take place in 1931; in November of that year, a notice in the papers warns the British that the Thames will freeze over in two weeks. By November 15th, people will know that this is no joke. The notice is signed "He Who Controls".

On November 15th, when the predicted freeze arrrives, the placer of the notice, one Boric Hengsten shows himself and demands one million pounds sterling. He has a grievance against the government—a bit of private and personal injustice to be righted. He makes a proposition: they are to place one million pounds to Hengsten's credit, and keep him under guard. He is then to send a cablegram in

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private code to New York. If the cold wave begins to ebb shortly afterward, disappearing entirely, he will be released and permitted to depart with the money. The government agrees and does its part. And the cold wave vanishes, restoring Britain's weather to normal.

What Hengsten, who is an oceanographer, did was to locate a particular spot:

> "...in the neighborhood of the West Indies which would be the controlling locality in the Gulf Stream. ... I was laying a few cement foundations at a crucial point in the ocean bed. These obstructions, aided by a dozen large pumps placed at just the right spot, started a deflection of the North Equatorial current at its key point of strength. ...and soon the whole drift was headed south."

HENGSTEN calculated how long it would take for the cold wave to show up in Britain; he timed his arrival and the notice in the papers. His message to New York was rerouted to his assistants in the West Indies, who stopped operations; nature then took its course, restoring the Gulf Stream to its original path.

Whether there *is* such a crucial point; whether a diversion could be made as simply as the author has it here; and whether such operations could be concealed, might be debatable. But the principle seems sound enough—and since Mr. Jones was not too specific, "Reprisal" seems to be a satisfactory account of something which might have happened in 1931. The statements are made under correction of oceanographers and oceanologists in the audience.)

IN THE "Discussions" department, one reader defends artist Frank R. Paul (who did all the covers of *Amazing Stories* up to and including this issue, and most of the interior illustrations); questions some aspects of "The Ancient Horror" and "The Way of A Dinosaur"; notes—as did other readers—that since the Yeast Men were shot from guns into

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the enemy territory, and started moving forward at once, a statistical half of them would land facing the wrong way, so would head back into the country of their origin; and thinks that the title of the magazine should be changed to *Scientification.* Another reader discusses the fourth dimension and the proposed science club. The letters in this issue are all of interest, but I mentioned the two above since the first was written by Ray Palmer, and the second by Jack Williamson.

"The Skylark of Space" concluded in this issue, and would be the most talked-about science fiction novel in a decade. Oddly enough, there were few imitations. John W. Campbell's "Beyond The End Of Space" (March, April 1933) used a very similar plot, and George O. Smith revived the Rover Boys atmosphere with fun-loving, wise-cracking scientists—but "Skylark" did not start a trend in science fiction novels, even though a list of stories derived from it would make a long article.

Despite the inane conversations and unbearable romantic sequences, "Skylark" can be enjoyed today. However, there's one point where I'd like to dissent from general opinion. Marc C. DuQuesne is not a convincing character; he seems that way only because everyone else is so flat. But a man as intelligent as DuQuesne is alleged to be could not be the emotional zero that DuQuesne is, unless he were suffering from severe psychopathic dis-

[*Turn To Page* 130]

2 Unusual Novelets of Tomorrow
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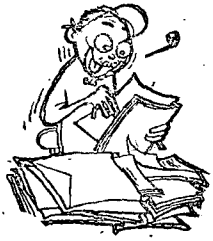
The Editor's Confidential

Drop into our office almost any day, and you're likely to find the editor looking like this. Stanley's trek through darkest Africa, searching for Livingstone, has nothing on our endless quest of really outstanding stories for you.



Lord help us — what's this? Has the editor stripped his gears under the terrible strain? Is he *non compos mentis?* About to run amok? No! HE'S FOUND THAT ELUSIVE, OUTSTANDING STORY!

Jubilatio in excelsis! It's time to blow the horn to jump for utter glee, to proclaim to all and sundry (including Mrs. Sundry and the twins) that we have a GREAT new serial novel awaiting you!

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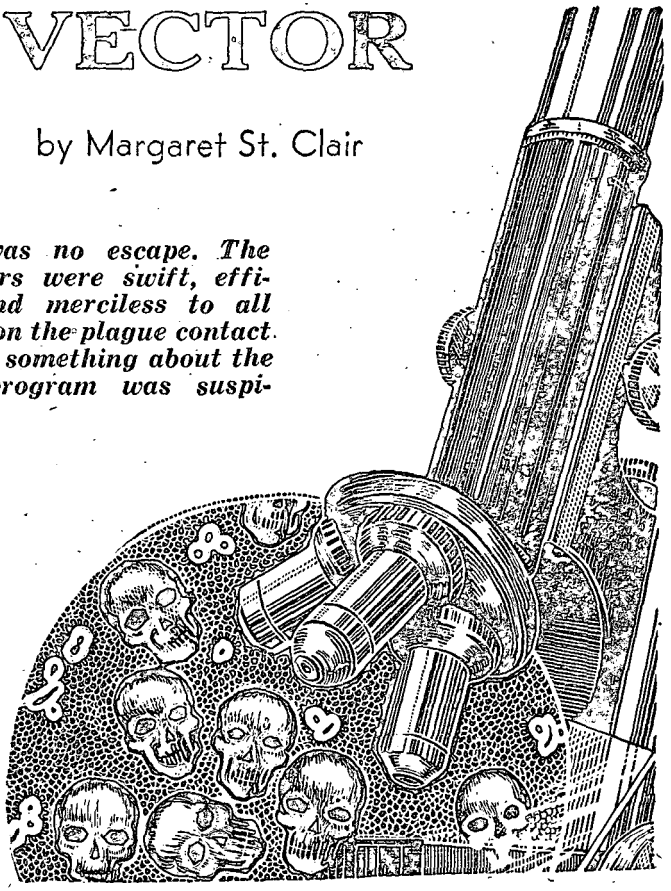
VECTOR

by Margaret St. Clair

There was no escape. The Burnadors were swift, efficient, and merciless to all persons on the plague contact list. But something about the whole program was suspicious . . .



THEY WERE drinking their after-dinner coffee, looking idly at the table-top TV, when the viz rang. Evan went to answer it. When he came back his face was so white that Nelda's heart gave an immediate terrified thump.

"What . . . ?"

"I've . . ." Evan licked his lips and swallowed. "I've . . .

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been reported on the plague contact list," he said in an unsteady voice. "Possible vector. The Burnadors are going to make a domiciliary visit on us tonight."

Nelda fitted her coffee cup into its saucer carefully; her fingers no longer seemed to be hers. Looking up at her husband's white, terrified face, she felt that she could see her own terror reflected in it as if she were looking in a mirror. She knew—they both knew—that he had a very slim chance of being alive at this same time tomorrow night.

Not because of the plague. No, people whispered that the plague was almost never fatal, despite the stern measures the interim government had adopted for fighting it. But if the Burnadors (actually, it was the Plague Protection Bureau) visited your dwelling, you were almost certain to be...burned. They got a bounty for each fired body they brought in. And then, they seemed to like burning for its own sake.

"We—could we—we might try to get away. To the Republic," she said.

"What good would that do?" Evan answered. He sank down heavily in his chair. "They'd be sure to stop us at the jet plane ticket office. Don't forget, I'm on the list as a possible vector. And you know what the penalty for trying to escape is."

YES, SHE knew. Under the threat of the danger of the plague, the government had forced through a penalty for evasion that was worse than the death the Burnadors gave. And there was a chance, a faint one, that the Burnadors would let them off. Once in a while, they spared a visitee.

"*Were* you in contact with a plague victim?" Nelda asked in a thready voice.

"I suppose so. Burke, who has the lathe next to me at the shop, had a sort of seizure yesterday. Falling fit. It might have been the plague. Anyhow, I'm on the list."

On the list, Nelda thought, and therefore almost certain not to be alive at this time tomorrow night. And what about herself? She'd been in contact with him. Wouldn't they... burn her too?

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"When will they be here?" she asked.

"After it gets dark, I suppose," Evan answered. He looked around the familiar room vacantly, as if he had never seen it before. "People say they never make visits during the daylight hours. Any time during the night."

So Nelda and her husband didn't know how long they had to wait. For a moment Nelda covered her face with her hands. Why had this happened to them? They were quiet people, in early middle age, who both worked and paid all their bills. They'd never had any children. They didn't read many books, they watched the same TV shows that everyone else did, they'd never had radical opinions. But now Evan was on the plague contact list.

IT BEGAN to get dark. They sat opposite each other and tried to talk. Once Nelda said, "We're middle-aged, anyhow. That's in our favor, dear."

"Yes. People say the Burnadors sometimes let older people off with a quarantine. We must try to think about that."

Evan got out a bottle of gin. They both drank. The liquor didn't warm them or comfort them—they were too badly frightened for that—but it did blur things a little. Nelda wanted to know what government department the Burnadors derived from, actually, and Evan answered that he'd heard they were actually supplied with funds by the Navy. He added there'd been rumors of clashes between the Burnadors and the ordinary civil authorities, who were inclined to resent their wide extra-legal powers.

The level of the gin in the bottle went down. About eleven o'clock Evan got up abruptly and said, "I'm going to go to bed."

"You—you won't be able to sleep."

"No. But I can't stand sitting here any longer, watching you be so scared."

For a moment they clung together. Then Evan, with a final hug, released her and started down the hall to the bedroom. He walked like an old man.

NELDA FELT she couldn't bear to undress and get

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into bed beside him. To lie there in the dark, tensely waiting for the firebulance—that was what the truck in which the Burnadors rode and carried away their victims was called; sinister baby-talk—to lie there in the dark waiting for the firebulance to come... No, she couldn't do it. She couldn't sit here waiting, either. She'd—she'd clean house.

The floors needed waxing; she'd wax the floors. She got out the heavy waxing rod.

She worked rapidly and efficiently, except for the moments when she stopped, rigid and immobile, almost unable to breathe, remembering what she had heard, and seen, of the Burnadors.

Two years or so ago the dark red, shiny firebulance had stopped down at the end of Nelda's street. She had peered between the blinds and seen the doctor and his Burnador crew getting out. The Burnadors were very thin, dressed all in black. People said that was for protection against the intense heat from the fire torches they carried, and that that was why their eyeballs and teeth were blackened too. But looking at them, weaving restlessly in the street behind the doctor, Nelda had found it easy to believe the other thing people whispered about the Burnadors—that they weren't human beings at all.

PEOPLE said (and the government had never troubled to deny it) that they were either androids, whom the government had created expressly for their inhuman task of burning—or that they were inhabitants of Mercury, which the government professed to have reached several years ago. It mightn't be true. The interim government might have spread the rumors itself, to impress its citizens with the extent of its scientific progress. But the Burnadors, on that night two years ago, had not looked like men at all.

Nelda drew a deep, quivering breath and went on waxing the floor.

It was almost twelve when she heard a soft whoosh in the street. She dropped the waxing rod and ran to the window. It was the firebulance. But

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it had stopped across the street—at 441, instead of 442.

Oh, could it be a mistake? Were they going to fire somebody else, instead of her and Evan? If they got the wrong people, would they be satisfied and go away? Nelda clung to the cord of the blind and watched.

The Burnadors got out. They were worse, worse than she had remembered. You couldn't see them without being sick. They went into 441.

THEY WERE gone only a little while. They came back with a stretcher and something lying on it covered with a sheet. A faint, dreadful smell hung in the air.

Nelda felt weak with relief. Ashamed, too, because it wasn't right to be so glad that somebody had died in your place. But, glad.

The dark-red firebulance started up. It made a U-turn, and stopped in front of *her* house.

The door bell rang. Nelda, as jerkily as a puppet, went to the door. The waxing rod was still in her hand.

The doctor looked like an ordinary man. The Burnadors, black and thin, wove in an uneasy, flickering dance behind him on the step. "Where's the infected man?" the doctor asked.

"...In...in the back," Nelda said. She could hardly talk.

The doctor and the Burnadors pushed past her. Nelda stumbled after them. They weren't paying any attention to her. Her turn, she supposed, would come later. When Evan—when they were done with him.

The doctor had turned on the light. He stripped the covers from Evan and began examining him. It was a very brief examination. Then he said, "I see from the dossier that you were in Nevada between 1963 and 1966."

"Yes," Evan's wavering voice replied.

"No children?"

"No, none."

"How old are you?"

"Forty—forty-five."

THE DOCTOR seemed to hesitate, and Nelda felt a thread of hope. Maybe that

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was old enough, and the Burnadors would go away.

The doctor stepped back from the bed. He said, in a crisp, firm voice, "He's infected. A vector. Burn him, b..."

Nelda had the heavy waxing rod in her hand. She had no conscious thought of using it; but at the doctor's words she struck out wildly with it.

She hit the doctor hard on the back of the neck with the weighted end of the rod. He went down instantly and silently.

"Vector," Nelda said between chattering teeth. "Vector. He—he—" She stepped backward jerkily and almost fell.

The Burnadors' torches had been already lifted for the firing. The creatures flickered uneasily at Nelda's voice; then the foremost Burnador touched the release button on his torch. He turned its colorless fury on the man who was lying on the floor.

The doctor may have groaned. If he did, the sound was lost in the whispering breath of the unleashed fire. Then the ghastly smell of burned flesh filled the room.

For a moment nobody moved. The Burnadors' uneasy flickering stopped. A searing wave of heat brushed Nelda's cheek and died away again.

ONE OF THE Burnadors unfolded a stretcher. Two of them loaded the doctor's light, crisp body on it and covered it with a sheet. They seemed to hesitate. Nelda, who was looking directly at them, saw that the whites of their eyes were so suffused with blood that the whole eyeball looked black. The pupils of the eyes were black holes.

The Burnadors hesitated a little longer. But when no order came, all four of them moved slowly from the room. Nelda heard their steps in the hall and the sound of the front door closing.

There was a stir from the bed and Evan sat up. His lips were a bruised color. Nelda knew he had a weak heart.

For a moment he gasped and panted for breath. Then he asked, "What happened, Nell?"

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Nelda felt that her knees were giving way. She stumbled toward the bed and collapsed on it. She put her hands on Evan and babbled syllables at him.

He hugged her to him. She could feel how wildly his heart was beating. Once more he said, "What happened, Nell?"

"I—hit the doctor. I didn't even mean to. The waxing rod was in my hand, and... He fell down. And then one of them burned *him*. They burned him instead of you, I guess. Evan, I didn't even think you'd be alive!"

"DID YOU say anything when you hit him?" he wanted to know. "It seems to me I heard you say something... I wonder why he asked about my having been in Nevada. That was odd."

"I don't know whether I said anything. Oh—I guess I said 'Vector' twice. That was what he'd called you. I just repeated it."

"And then the Burnadors fired him," Evan said thoughtfully. "It sounds as if they thought you were telling them he was a vector. Will they do whatever they're told? They must be very suggestible."

"Maybe all human beings look alike to them," Nelda suggested. "If they're not human themselves, humans might."

"You got a better look at them than I did," Evan said. He stopped to pant and gasp. "What do you think the Burnadors are?"

"Human beings," Nelda decided. "Their eyes are funny, but they're human eyes. I think they're men who have been worked on in some way, maybe drugged... Evan, will they be back?"

"I imagine so, with another doctor. Unless... Honey, go to the front window and see what they're doing. We're alive when we didn't expect to be, and— I'm going to get dressed."

"They're putting the doctor in the firebulance," Nelda reported when she came back. "Now they're standing around in the street. They don't seem to know what to do next."

"UM. HONEY, I want you to call the cops. Tell them a firebulance came to our

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street, and the Burnadors in it have gone crazy. Tell them they burned their doctor on the doorstep and after that they broke up the firebulance and set fire to it. Tell them you're afraid they'll fire the whole street. Lay it on thick. Tell them to send a police squad. Tell them the Burnadors have gone mad."

"But—the Burnadors haven't broken up the firebulance. They're just standing there."

"They will, though, because I'm going to tell them to." He added in quick explanation, "They've been drugged, and it makes them docile and suggestible. They'll take orders from any authoritative person. Anyhow, it's worth trying. Hurry and make that call."

Still Nelda hung back, "Evan, they may burn you!"

He managed a wan grin. "What do you think'll happen to us if I don't try this? This is our one chance."

Nelda did as she was bid. Her pale face and trembling voice must have been convincing, for before she had finished talking the cop on duty was calling out a squad car.

Nelda hung up. The viz screen grew blank. Through the lattice of the blind she could see a flicker of light in the street and figures moving in front of it. Then a loud roaring noise and a gush of intense leaping white light. They had set the firebulance on fire.

EVAN CAME back in the house. "They did it. Then I told them bad men were coming and they were to turn their torches on them. Only thing I'm afraid of, they'll fire the street. But I guess everybody in the neighborhood is awake by now and has a chance to get out."

He started toward the viz. "One more call," he said. "Then we'll get out ourselves."

"Plague Protection Bureau?" he said into the viz. "There's a battle going on in our street between a Burnador squad and a bunch of cops. No, the firebulance had just stopped when the cops attacked them. Unprovoked. What? They're using explosives and firehoses. Half the street's on fire. You'd better send more Burnadors. We won't have any plague pro-

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tection at all if this goes on."

He turned from the viz to Nelda. "They believed me," he said. "The cops hate them, and they hate the cops. With any luck, this ought to develop into a nice civil war. Now, let's try to get out."

They went through the back of the house to the cubicle where the motor scooter was kept. Evan trundled it through a neighbor's back yard and into the next street. He mounted and Nelda got on behind him. "We'll go as far as we can," he said. "I brought all the money there was in the house. ... I wonder why he asked about my having been in Nevada. That was odd."

THE SCOOTER, after only a couple of misses, started. There wasn't much traffic at this hour. Once a cop car, driven at high speed, passed them. Most of the time they met no one; there was only the rush of cool air and the increasing light in the sky.

At the edge of the city they halted. They still had plenty of gas, but they were afraid they would be turned back at the city barrier and put in custody.

They had come to a little rise. From it they turned and looked back at the city.

The eastern sky was a sea of reddish, lurid light. Smoke was billowing up. Even at this distance they could hear muted shouts and the sound of fire sirens. The city seemed to be on fire.

"Cops and Burnadors couldn't be doing all that," Evan said. "A good many private people must be joining in. Well...nobody could go on living under the shadow of that fear. No wonder they're setting the city on fire."

Nelda tightened her grip on his waist. "Evan—oh, if we could get through to the Republic! To California! They say it's different there."

"Who knows?" her husband said. "Perhaps by tomorrow it will be different here. There may not be an interim government any more. Then we could get through. ...I wonder why he asked..."

HE WAS SILENT. Nelda, her arms around him, had slipped into a light doze. He

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said, in an abruptly different voice, "I know why he wanted to know about Nevada."

"Um?" Nelda answered sleepily. Terror and relief, the tortures and anxiety of the day, had exhausted her.

"Yes. Wake up, honey. This is important. . . .There never was any plague."

"Nobody was ever really convinced that there was," Nelda answered. She yawned.

"Yes. The plague scare was something the government cooked up to hide something else. I wasn't on the plague list as a possible vector because I'd been in contact with Burke. I was on the list because. . ."

"Because why?" Nelda demanded.

"Because I'd been in Nevada between 1963 and 1966."

"Those were the years they were doing so many super-bomb tests," Nelda said. "You mean you might have seen something classified? Something a civilian shouldn't have seen?"

"Not seen," said Evan, "*Experienced.*" He gave a little laugh. "Those were the years there was the most talk about fall-out. Geneticists warned that the super-bomb debris had a particular affinity for the sex cells.

"DO YOU REMEMBER how quickly the talk died down? The interim government put a stop to it. People were assured the tests were quite harmless. Nevada was crowded with visitors who came to see the big, pretty, innocent fireworks. They went home again. They felt all right. But when they started having kids. . .

"So the government cooked up the plague scare and sent out the Burnadors against the people—the young people—who'd been in Nevada during the dangerous years. And they went on with the tests. The omega bomb.

There was a silence. The light in the sky behind them was growing brighter. Evan said, "Anyhow, we're safe tonight. Tomorrow we'll try to get through to the Republic."

"Yes." Nelda drew a deep sigh. "Evan—do you think you were damaged? I don't mean genetically. I was always frightened to have children. I

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can do without that. I mean, in yourself. Your weak heart. They used to say that radiation exposure shortens life."

There was a pause. Then he said, rather roughly, "We're alive. We might both have been fired. Don't go finding something else to worry about."

Nelda kissed him. It was all he could think of to say. They both knew it wasn't enough.

SCIENCE FICTION ALMANAC

The dates listed are those that appeared on the magazines, rather than the dates when they appeared on the newsstands.

NOVEMBER

1930: *Wonder Stories* now pulp size. (The first large-size magazine to make a size-change.)
1931: *Wonder Stories* returns to large size, semi-slick paper.
1933: *Wonder Stories* re-shifts to pulp size; Charles D. Hornig now editor.
1939: *Future Fiction,* Vol. 1, No. 1; pulp size; bi-monthly; Charles D. Hornig, editor.
1949: *Other Worlds,* Vol. 1, No. 1; digest size; bi-monthly; Raymond A. Palmer, editor.
1952: *Science Fiction Adventures,* Vol. 1, No. 1; digest size; bi-monthly; Philip St. John, editor. (This was the first magazine to use the title.)

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1953: (marginal) Final issue of *Fantasy Fiction Magazine*, Vol. 1, No. 4.
1955: *Infinity*, Vol. 1. No. 1; digest size; bi-monthly; Larry Shaw, editor.

DECEMBER

1940: *Comet*, Vol. 1, No. 1; pulp size; monthly; F. Orlin Tremaine, editor.
1949: (marginal) *A. Merritt's Fantasy Magazine*, Vol. 1, No. 1; bi-monthly; Mary Gnaedinger, editor.
1950: *Worlds Beyond*, Vol. 1, No. 1; digest size; monthly; damon knight, editor.
Two Complete Science-Adventure Books, Vol. 1, No. 1; pulp size; quarterly; Jerome Bixby, editor.
1952: *Dynamic Science Fiction*, Vol. 1, No. 1; pulp size; bi-monthly; Robert W. Lowndes, editor.
1953: *Spaceway*, Vol. 1, No. 1; digest size; bi-monthly; William L. Crawford, editor.
Final issue, *Science Fiction Adventures*, Vol. 1, No. 7.
1956: *Super Science Fiction*, Vol. 1, No. 1; digest size; bi-monthly; W. W. Scott, editor.

notes

The "Science Fiction Almanac" has been compiled by the editor, as a service to collectors. We hope it will be of use to science-fictionists, old-timers and newcomers alike, who want to build or round out sets of their favorite magazines. It is also, incidentally, a capsule history of American science fiction and fantasy publications. If you, the readers, so wish, we may publish additions and corrections from time to time; on this point, we await word from you.

Up to 1939, there were very few science fiction and fantasy publications; it was possible, in that era, for a fan or constant reader to obtain and read each and every issue of every publication devoted to fantasy and science fiction. Thus, changes of editors, of the size, or the frequency of the magazine, were matters of considerable interest.

The first "boom" started in 1939; the number of titles both multiplied and shifted rapidly, as did editorial personnel. Thus, the new collector should not assume that the publishing frequency noted at the time of the first-issue listing represents the

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frequency in which the magazine actually appeared thereafter. This was a statement of intention, not always achieved.

Newcomers may wonder at such listings as "Charles D. Hornig now editor" of *Wonder Stories* when a glance at the cover of any issue of the period distinctly proclaims, "Hugo Gernsback, Editor". The reason for this is that, while T. O'Conor Sloane, Charles D. Hornig, Sam Moskowitz, etc., did most of the operations with which we associate the term "editor", Mr. Gernsback took a personal interest in every issue of each science fiction magazine he published. At all times, you will find the stamp of his unique and impressive personality on the magazine. No one, for example, has ever equalled—let alone surpassed—his editorials, which occupied a single page in the magazine, except for a few special occasions. And with such exceptions, where they were concerned with a contest, or with the magazine itself, these editorials were always on scientific subjects, with very definite tie-ins to science fiction. They were informative, interesting, and accurate in light of scientific knowledge at the time; more than that—they were stimulating. There is no telling how many readers were prodded by a Gernsback editorial, into experiment or research they might not have undertaken otherwise; nor can we estimate the affect upon authors and authors-to-be.

But the person to whom you wrote letters (particularly in the later period), and who wrote the replies in the letter department, was the man you thought of as "editor", while Mr. Gernsback was thought of as editor-in-chief. That is why oldtimers speak of the "Lasser" or "Hornig" or "Moskowitz" days of a Gernsback science fiction magazine.

Finally, some readers have asked about the meaning of the "(marginal)" before various titles. The meaning is simple—such magazines were not 100% science fiction in intent. For example, *Ghost Stories* was entirely fantasy; *Magazine of Fantasy and Science Fiction* is intended as a vehicle for both fantasy and science fiction; *Weird Tales* used some science fiction.

Scientific Detective Monthly (which became *Amazing Detective Tales*) was a detective magazine with a distinctly scientific slant, and included some stories which might be considered science fiction.

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DOWN TO EARTH

DO WE KNOW?

Dear RAWL:

I'm inclined to favor Richard Kyle's definition of science fiction because of its all-inclusiveness; he's right in saying that it covers all types of stf stories. However, the search for the *perfect* definition still continues—for there are two main faults in his effort.

First, it is *too* inclusive. To myself, an avid reader of stf for several years, it is clear and true. After reading Mr. Kyle's letter, then going over the definition a few times, I am able to understand what he is saying, and to see where it would be correct. However, what about the person who is altogether ignorant of stf?

The ideal definition is one that defines a word or object in such a way that someone having no knowledge of that object could read the definition, and immediately know what it is. An outsider reading this latest definition would still have only a very vague and uncertain idea of what science fiction was all about.

By trying to include everything, he has lost the main point of the objective; not only are we looking for a definition that fits all the facts, but also one that is lucid and easily understandable.

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Frankly, this is going to be hard to come by. For one thing, stf is no sharply-defined field; the limits are too uncertain for a perfect definition to be written; even mine, which I was *positive* covered everything, has yielded several exceptions.

Well, anyway, *we* know what stf is.

Don't we?

Buck Coulson has a lot of truth in his statement about your covers; you seem to be in a sort of rut. You've had a girl on the cover of the last five issues—this may have been ok for TWS, but not for good ol' *Future*.

Don't feel too badly—*Infinity* has had girls on all but one of its seventeen covers! *Astounding* has had one girl in the last twenty-seven issues, and she was a scientist with a turtle-neck sweater *and* a jacket on. However, ASF *has* had twelve different aliens featured in that same space of time.

Enough statistics. To get back to covers, (or were we away from them?) the July SFS furnishes a perfect example. Here we see a space station burning up in the atmosphere as it re-enters—I guess. However, if it *were* entering the atmosphere, would we see stars so clearly in the pitch-black sky? And isn't that white border on the earth, far below, the atmosphere?

Well, just for fun, let's say it *is* re-entering. This would be swell except for the fact that it is burning up at the wrong end! How a wonderful artist such as Emsh could slip up here, I'll never know...but wouldn't the *front* burn first?

The details on this painting are obscure, your printer made the overall effect blurry, and somebody (guess who?) has put that antiquated "A Double Action Magazine" on again. Now this would be swell if I knew what a double-action magazine was. Is it a string of mags? Is it a type? Are *all* Columbia Pubs Double Action mags? Do you really think anyone will buy SFS over any other mag, all things being equal, because of that little triangle? This is a hold-over from the fondly remembered pulp days; but it has little business right on top of my cover!

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Stories are all excellent, as usual...but why print some stories in a different size type than others? This gives the whole mag a slip-shod appearance.

I love the editorials, so keep them up! Wonder how long, at your present rate, it'll take to get down to the present?

Actually, I feel kinda guilty for finding so much fault in this letter with two of my favorite mags—I'll bet editors very rarely hear the good side of things! Take my rantings *cum grano salis*, though, and you'll find they're really given in good spirit.

ROGER EBERT,
410 East Washington,
Urbana, Illinois

Do we know what science iction is? Well, that's exactly the assumption I've been hallenging all along in this usiness of trying to get at a lefinition for science fiction. All of us, individually, know vhat each of us *thinks* it is—know what *I* call science iction, and what I won't llow as science fiction when see it. You know what *you* all science fiction, etc. So, : seems to follow that *we* now what science fiction is -only it is not wise to assume that you and I really know the same thing until we've hit upon a mutually-acceptable definition.

If you will read "The Moon —Good Night" by Mack Richards, I think you'll see that Emsh's scene is quite satisfactory—and isn't exactly what it appears to be. The Columbia chain of fiction magazines is known as the "Double Action Group", for the conveniences of advertisers. And the "double action seal" is an identifying mark for dealers, having to do with the distribution end. It appears when the publishers feels its presence is necessary.

While "Yesterday's World of Tomorrow" deals with science fiction of thirty years back, it isn't intended merely as a "30 Years Ago in Science Fiction" department. I'm trying to explore the origins of various types of story, treatment, scientific or pseudo-scientific gimmick, plot-form, etc.; and to note how much of magazine science fiction's general character was formed in its first years. I do not think we will go beyond 1936, which closed the Gernsback period; and it may not be necessary to go as far as that.

(All depending, of course, upon whether the readers want to see this series continue. May I suggest that you send in your votes early? Thanks.)

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STRAIGHT FROM THE SHOULDER

Dear Sir:

You seem to be very sincere (page 115, April 1958, *Future Science Fiction*) in asking for reader reaction and I want to be equally sincere.

Your April issue was O. K. but...? Like most of our modern SF it didn't quite satisfy, and I, who have been a SF fan since the early days of *Astounding* and *Amazing*, have I think begun to understand some of the reasons why.

FIRST: Too many of our modern SF stories are not really stories, but only expanded incidents.

SECOND: Our modern SF heros are passive. Their world works on them, and they chronicle the events and— So what?

THIRD: (and this is the point which saddens me most) Our modern SF has fallen into the snappy-ending trap which deprives the reader of the dessert of emotion that he is entitled to savor after the good meal of the story is finished. In this April issue I would say that only "The Woman You Wanted" is entirely free from this fault, and I grieve the more because a competent rewrite man could have made the ending of most of the others just as satisfying.

Please forgive me if I have seemed harsh. I do not mean to be, for your stories are, I think, a bit better than most of our modern SF—and I know that an editor's job is always a difficult one.

Let me wish you the best. I will be watching for your May issue on the news stands.

V. BRYAN BINGHAM,
Box 207,
St. James, Minn.

You'll Congratulate Yourself

For foresight, if you take steps NOW to insure your receiving the January 1959 issue of SCIENCE FICTION STORIES, starting the great new serial, "Caduceus Wild", by Ward Moore and Robert Bradford!

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There's no need to apologize for frankness, Mr. Bingham—and I do think you've put your finger on some very common faults in present-day science-fiction. Perhaps some of our other readers would like to amplify or argue this a bit, so—although I could go on at considerable length with my own ideas, I'll give someone else a chance to carry the ball first.

REBUTTAL

Dear Mr. Lowndes:

Your comments on my letter in the August issue of *Future* were interesting. But I think that you have quite missed the point I was making.

Your comments seemed to indicate that you believed that the Finite System (the religious philosophy of a created universe carried to its logical end) and the Infinite System (the scientific philosophy carried to *its* logical end) can be reconciled.

My whole point is that, if one adheres to strict logic, the systems cannot be reconciled, because they are based on two mutually exclusive conceptions. One of these conceptions provides the basis for the scientific method, and the other the basis for all religious beliefs. I described these two conceptions in detail. But apparently because I was so close to the ideas, I seem not to have gone into them sufficiently.

Before I reply to your criticisms, I want to make it clear that I am not speaking of an inability to reconcile science and religion in the *real* world. I am speaking of the inability to reconcile the *philosophies* (the man-created conceptions) of science and religion.

In the field of mathematics, for example, there is Zeno's Paradox—which "proves" that something that occurs in the real world just can't happen. No one, though, assumes that the fallacy lies in the real world; I think it is agreed that the fault lies is in the mathematics: they were devised by man.

We must, I feel, if we are to be complete men, believe that in the real, *total* world the areas of science and religion do merge in some as yet not understood way; but this belief can not now be more than an expression of faith, completely

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unsupported by any of the logical systems man has yet devised. And we must also as complete men determine and then question our thinking in all areas to find if our theories are consistent with observable data. If they are not, then we must endeavor to devise new theories; for it is only when we are aware of what we do not know, that we can make an effort to discover the Truth. Zeno's Paradox lies still unresolved; the philosophies of science and religion are yet unreconciled; but since we know they are unresolved and unreconciled we have a much greater chance of solving these problems than if we were ignorant of them.

I chose Christianity as an illustration of what I called the Finite System because the "chain of command" in Christianity is so clearly defined. There is little confusion to cloud the basic issues. Although God may have three aspects, He is still one god; He is complete. I did not choose it for any other reason. I was not trying to prove or disprove the validity of Christianity or any other religion. I was simply pointing out the basic philosophy that underlies Christianity (or any religion that assumes a Creator) and indicating that it differs from the one that science is based on. And it is this difference that eventually makes the difference between stories of science and stories of magic—science fiction stories and fantasy stories.

To make my points more easily understood, perhaps it would be well to use as illustration the two principal political conceptions of our world, the monarchy and the democracy, for they provide interesting and almost exact parallels to the philosophies under discussion.

In an absolute monarchy, the ruler makes all laws and possesses all power; his subjects possess only the power he delegates to them. In an absolute democracy, the people make all the laws and possess all power; no individual holds more power than another. No compromise between these systems is possible. If the people hold as much power as the mon-

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arch, he cannot rule them—and so cannot be a monarch; if the monarch possesses as much power as the people, they cannot limit his actions—and so it cannot be a democracy; it is chaos.

In the Finite System, the Creator makes all laws and possesses all power; His creation possesses only the power He delegates to it. In the Infinite System, the universe contains in itself all law and all power; and no element of the universe is above the law or holds greater power than another. No compromise between these systems is possible. If the universe holds as much power as God, He cannot alter it—cannot be omnipotent—and so He cannot be God; if God holds as much power as the universe, the universe cannot limit His actions—cannot be self-contained—and so it cannot adhere to the Infinite System, the scientific philosophy; it is chaos.

Because the scientific method demands that an experiment be repeatable, no uncontrollable element can be allowed into the method. God is uncontrollable, therefore He cannot be allowed into the method.

Because religious belief demands that God be omnipotent—that he be uncontrollable—there can be no compatibility between the two philosophies.

Now, of course, all that I have just said about political systems and "universe systems" is all theory. In the real world there is not and there never has been an *absolute* monarchy or an *absolute* democracy. It is unlikely that in the real world there has been a religion with the extreme of belief that I have described, or a scientist who saw such a limited end. Ultimately, however, *all* political systems or universe systems fall in one or the other of those categories.

For in the real world, men have not achieved—in all of their practical application of these systems—a fusion of the two political theories. The success that the modified forms of these systems enjoys depends—and depended—on factors beyond the actual structure of government: on delicate balances of personal power, moral power, social power, and so on.

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Our form of government works, not because of any inherent perfection of form—South American countries with our system show this by the very transience of their regimes—but because the vast majority of us want it to. The same is true of other governmental systems. Probably since the dawn of reason, Man has struggled to conceive of a political theory that will be acceptable to all men and all circumstances. Neither the two main theories he has devised, nor all their modification in practice, have gained this end. Not one political system has been created that in *complete* success combines all the virtues of the monarchy and of the democracy. We are still trying.

Much the same thing applies in the real world in the areas of science and religion. Whenever Man has been driven by his logic to attitudes in these areas he feels are truely irrational, he has resolved the attitudes by rejecting the logic and relying upon his profound inner beliefs. A logic that can prove both theories right, he believes, is a faulty logic. However well, though, Man has been able to resolve within the unknown interior of his being the essential concepts of science and religion, he has never managed to externalize it in the form of a wholly logical philosophical system. We are still trying.

We are still left with the two I have described.

Now, perhaps it is time to discuss your criticisms of my letter.

My statement, "In Christianity, God created the universe; He established law and order in it—but He is not Himself bound by any of those laws. If He wishes to nullify the law of gravity, or alter it, or suspend it, He may," does *not* assume (to quote you) "that we know what the 'laws of the universe are.'"

It *does* assume that the universe is subject to law of *some* kind. That is all. What the law (or laws) may be is irrelevent to the issues at hand. And most men do assume that the uni-

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verse has order, I think. We conduct our daily lives on that basis; our minds grasp at a certain predictability that seems to pervade things.

Your second point does not seem to me to be material to the discussion. You say the statement also assumes that "the Bible—Christians' source of direct revelation—is literally true, correct, and complete at all points."

How have you arrived at this conclusion? I merely stated—for the purpose of example—the Christian position on the nature of God. No more. No less. The same statement could apply to the Jewish or Islamic beliefs—or any faith that accepts one god. Whether or not the Christians are correct in their beliefs is not germane to the issue. (I might add, parenthetically, that I was told by a Southern Baptist minister not long ago that it is only necessary to learn and accept the New Testament to be "saved." I am sure that he would agree with the definition of God I have given. And there are some groups considered Christian, as you must surely realize now, that *do* profess to believe that the Bible is "literally true, correct, and complete at all points," and who would find your remarks concerning this inexact.)

"The most informed Christian belief," you say, "Is that God's seeming 'violations, nullifications, alterations' of the laws of the universe are actually manipulations of higher-precedence laws. This may *seem* (to our ignorance) to be infringement of the laws we 'know.' "

This is an interesting idea. It may well be true. We have no way of being certain. It does not, however, alter God's relationship with the universe.

If, for example, in an absolute monarchy, the ruler devises a group of laws to regulate his subjects, and then submits himself to those regulations, is he less an absolute monarch? I think not. At any time he wishes he can cease to obey those rules; his subjects cannot.

And in the sentence preceding the one I have just quoted, you said, "Granted that 'God

[*Turn To Page* 124]

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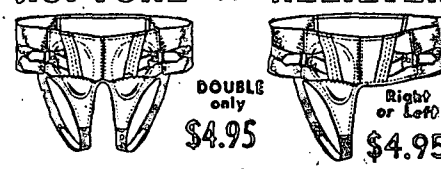

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is not bound' in the sense that the creation is inferior to the Creator, and/or that He has the *power and ability* to nullify, alter, or suspend the laws of the universe—this does not mean or prove that He actually does so."

Granted that God is not bound. That is my whole point. It makes no difference whether or not He has yet chosen to use His powers and abilities. What is important is that He is *not* bound, that he *may* use His powers and abilities if he *does* choose. The exercising of those powers would undermine the whole structure of the scientific method, for it is only the hypotheses in science that change, not the "facts" (repeatedly verified information) upon which the hypotheses are based—and if He used some of His powers those facts might well change. The possibility of this is one the scientific method quite obviously can't accept.

"What we call the 'supernatural,'" you write later, "Is therefore under law and order, but we do not know what these laws and orders may be at the time."

But "supernatural" acts can only be accepted as acts in agreement with the basic laws of the universe if it can be shown that these acts can *only* have arisen from a property of the universe. You have agreed that the Creator is superior to the creation; resultantly, He is not, then, a part of the universe. Since He is *superior* to the laws of the universe, any act He may choose to make that is not in accord with the functioning universal laws must be considered "supernatural," that is, above the natural laws of the universe. Therefore, although one can prove logically that nothing can occur in a universe without an omnipotent god that is not a function of that universe, one cannot prove this of a universe created by an omnipotent god. It is a possibility that is always present.

I believe that I have covered all the areas of your criticism.

In this letter I have, it is true, limited arbitrarily the number of conceptions of God to the primary one; but I have

[*Turn To Page* 126]

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done so to avoid confusion. The other possibilities add nothing to the discussion. There is the possibility that God created the universe and then abolished Himself—a singularly fruitless effort. Or that God created the universe and then subjected Himself *eternally* to its laws; but, then, the personality that resulted would no longer—by definition—be God, and would just be in the same boat with the rest of us. There is the possibility that the universe *is* God; if that is so, the description I have given of the universe of the scientific method would, of course, apply. There are other conceptions; they are no more productive.

In these two letters, Mr. Lowndes, I have defined all my terms. I have defined the field of imaginative literature which comprises science fiction and fantasy; I have defined science fiction and fantasy; I have defined the philosophy of science and of religion—the frameworks on which science fiction and fantasy are based. And I have, I believe, answered all of your objections honestly and completely.

I ask again: where am I wrong? I feel the definitions below are exact, precise definitions of the two fields. Perhaps they might be phrased with more elegance, but I don't think *anyone* can alter their factual basis.

Imaginative fiction: The branch of literature in which the events that occur are not—so far as it is known to the author—possible in the real world.

Science fiction: The branch of imaginative fiction in which all things are subject to law.

Fantasy fiction: The branch of imaginative fiction in which there is an agency from which all law and power devolves.

And, to quote my letter, "if, perhaps, that definition (of science fiction) sounds rather too simple, it is easy to test its validity. The reader has only to select a science fiction or fantasy story at random. If there is any agency in the story that—either by express statement or by implication—is not subject to the laws of the universe, it is a fantasy story. If

[*Turn To Page* 128]

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there is no agency of that kind—then it's science fiction."

It seems easy enough to me.

Writing a science fiction story about an omnipotent god is like writing a football story about baseball. It can't be done; the rules are different.

I'm sorry that this letter is so long—so very long—but looking back over it, I see no way of making it shorter; I have no idea of the precise areas of disagreement between us, and so I have tried to cover them all.

I've changed my address since I last wrote, you'll notice. I've made myself a moving target...

RICHARD KYLE,
Box 193,
Joshua Tree, California

It's much clearer this time, but I see that my objections could have been clearer, too. Actually, I think I do agree with the differentiations you have in mind—we're just haggling over terms.

It all depends upon whether the "agency from which all law and power devolves" is *omnipotent* or *omnicompetent*. An *omnipotent* god or ruler would be above the law, capable of suspending or altering

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it at any time—and if the analogies of human history mean anything, is most likely to do so, sooner or later. An *Omnicompetent* Creator is One Who has so devised that His purposes *never* require his infringing upon the laws of His creation, however much He may actually put his hand in. Thus, under such a God, "all things are subject to law" but at the same time, there is "an agency from which all law and power devolves."

Thus the "supernatural" (1) does not exist in a system lacking a supreme creator (2) would represent the interference of an omnipotent god (3) would represent the workings of an Omnicompetent Creator which are (at the time) beyond our comprehension, ability to reproduce, etc. And thus what was "supernatural" in times past *might* not be so today or tomorrow—although the "supernatural" still exists; there still remains an area beyond our comprehension, etc., at the given time.

I'm not saying you're wrong, good Sir Richard—but merely that your definitions don't satisfy *me*, as you've put them. But on the other hand, should it turn out that most people find them useful, then it's quite irrelevant whether, among the dissatisfied minority is Yours Truly, RAWL.

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(*continued from page 99*)

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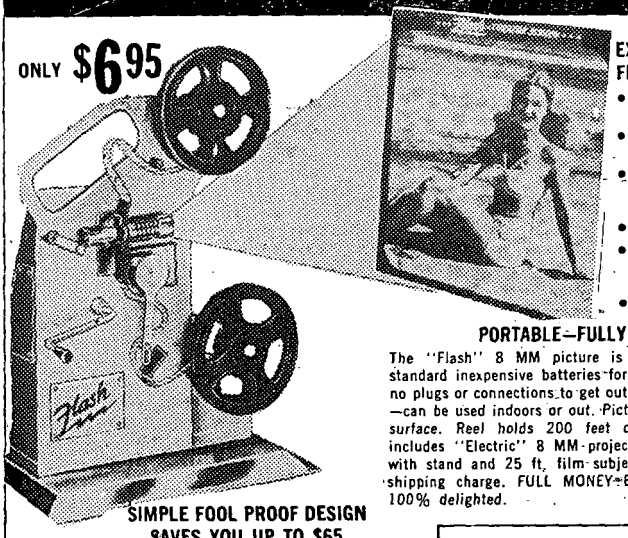

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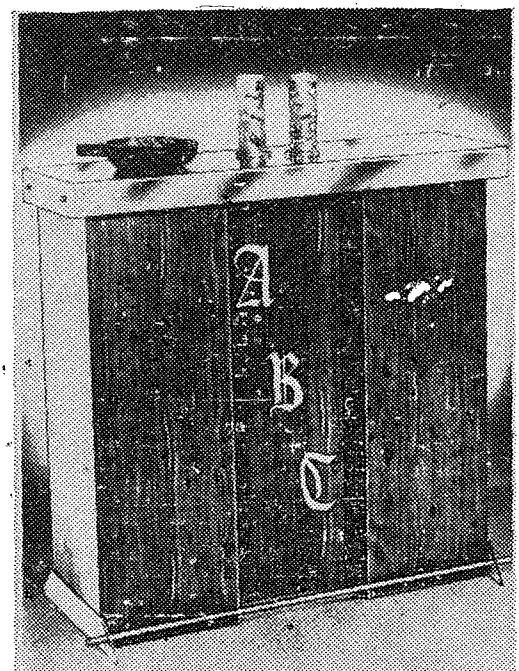

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